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Shirley Cleary



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About the covers

The wrap-around cover, "Fishing the Little Blackfoot," by Helena artist Shirley Cleary, is enough to make a fly fisher pack his or her rod and head for the nearest stream. As many will attest, if the Little Blackfoot is the goal, a sun-dappled day and speckled trout beckon.

Butterflies are "airy creatures" sporting "where the sun's rays are tempered by the shadow of trees." Steve Wirt's inside front cover photograph of the Hydespe fritillary makes vivid the ornamentation of these delicate, marvelous creatures.

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Trapshooting—a sport in which gunners attempt to hit airborne targets with a shotgun—has enjoyed a long and rich tradition in Montana. The distinguished-looking gentlemen in the picture at right were competing for Helena Rod and Gun Club honors in 1888—a year before Montana attained statehood! Trapshooting is still alive and well in Montana, although it seldom makes sports page headlines. In 1983, Montanans fired at more than 1.2 million registered clay targets (those shot at in trapshoots sanctioned by the Amateur Trapshooting Association); this does not include the million or more targets thrown for practice at trap ranges around the state.

What makes trapshooting so appealing to the many thousands of men and women around the country who pursue it? Obviously, the satisfaction derived from shattering a clay saucer less than five inches in diameter that is traveling at a speed of close to 60 miles per hour has something to do with it. As late trapshooting great D. Lee Braun explained: “The targets leave the trap house at angles unknown to the shooter when he calls for them. . . . Since most trap targets are broken at thirty to thirty-five yards distance, this gives you one short second after calling for your target to estimate its angle of flight, get the lead you will need—if any—take into account such wind conditions as may be present and fire.”

Whatever the exact reasons for its popularity, trapshooting has been around almost as long as the shotgun itself. In 1793, a British sporting publication referred to it as “a well-established recreation.” It had found its way to America by the early 1800s, and was, in fact, the first form of organized competitive shooting in this country. The sport in those early days involved the shooting of live, rather than clay, birds. The name “trapshooting” is derived from the cage-like boxes or “traps” that held the pigeons until the shooters signaled for their release.

The shooting of live pigeons began to lose favor in this country in the late 1800s, both for economic and humane reasons. Shooters with an inventive turn of mind, such as the legendary marksman Captain Adam

Trapshooting In Mo A GRAND OLD TR by Dave Books



Helena Rod and Gun Club Team—
Record—136 in a possible 150

A. J. Haskins captain
28 in 30

W. L. Cooper
27 in 30

S. A. Balliet
28 in 30

tana: 

ADDITION



38

J. Cronin
in 30

M. Manuel
27 in 30

H. Bogardus, began searching for alternatives. In 1877, Borgardus patented a glass ball target and a trap to propel it; but the Bogardus glass target and the several variations that soon followed had some drawbacks—they did not break easily and could not be thrown far enough. In 1880, an Ohioan named George Ligowsky patented a saucer-shaped clay target much like those in use today. Ligowsky, who is credited with being the inventor of the clay pigeon, began marketing his targets and traps in 1881; four years later, the first major clay bird tournament was conducted in Louisiana.

Thus, the gentlemen shown in the picture could have been shooting at glass balls or clay targets in 1888, but judging from the scores entered on the photograph, it is more likely they were shooting at live birds. Live pigeon races were often decided on the basis of 30 birds, while glass or clay target events usually consisted of 50 or 100 targets.

Organized clay bird shooting at the national level did not become firmly established until 1900, when the first Grand American Handicap Championship at clay birds was held on Long Island under the auspices of the Interstate Trapshooting Association. Grand American events have been conducted every year since—from 1923 to the present, under the auspices of the Amateur Trapshooting Association headquartered in Vandalia, Ohio. Every year in August, nearly 5,000 shooters from all over the country gather to compete in singles, doubles, and handicap events at Vandalia, shooting over a line of trap fields more than a mile long. It is said to be the largest single participatory sports event in the world.

In modern trapshooting, singles and doubles events are shot from a distance of 16 yards behind a trap—a mechanical device housed in a low structure called a trap house. A trap squad consists of five people lined up three yards apart in a crescent-shaped arc, so that all shooters are the same distance from the trap. Shooting is done in rotation, and after each person has fired five shots from a particular position, all shooters move one position to the right (except the shooter on the far right, who moves to the far left position). A “round”

of trap consists of 25 targets, five at each of the five stations. In singles, the targets are thrown at various angles within a radius of 44 degrees; the angle each bird will take is unknown to the shooter. In doubles, two targets are released simultaneously at fixed angles and are fired at successively by one gunner. The handicap event is identical to singles, except that shooters fire from distances of 17 to 27 yards behind the trap; each shooter is “handicapped” at a certain yardage based on his or her ability. Records from all registered shoots are meticulously kept and forwarded to the Amateur Trapshooting Association, and at the end of the calendar year each shooter receives a new “average” card showing his or her singles and doubles classification (AA, A, B, C, D) and handicap yardage assignment. These assignments may be changed during the course of the shooting year.

In Montana, the Montana State Trapshooting Association oversees the schedule of trapshooting tournaments conducted in 18 cities and towns throughout the state from February to October of each year. State trapshooting tournaments have been conducted each year in Montana since 1894, with the exception of 1945. In the early days they were held in conjunction with state fairs, and in later years were held in such diverse places as Gardiner, Cut Bank, Bozeman, and Butte. But in more recent years, the state shoots have been rotated among Billings, Great Falls, Helena, and Missoula, since these clubs are presently the only ones with facilities adequate to handle the 300 to 400 shooters who attend. Montana’s 90th Annual State Trapshooting Tournament will be conducted in Helena this summer, July 11-15.

To understand Montana’s long involvement with the sport of trapshooting, one must remember that guns and shooting—and naturally, marksmanship—were a way of life on the Montana frontier. Guns were an integral part of the settling of the West, both for defense and for putting food on the table. The members of the Helena Rod and Gun Club Team assembled for their photo only 12 years after Custer’s Last Stand on the Little Bighorn. During what author Bob Hinman refers to as “The



In 1877, Captain Adam H. Bogardus, legendary marksman of the late 1800s, patented a glass ball target, and a trap to propel it. This target was a predecessor of the clay pigeon.

Golden Age of Shotgunning"—1870 to 1900—market hunting was in its heyday and expert gunners were idolized by the public much as professional football and baseball players are today. The feats of people like Captain Bogardus, Doc Carver, Rolla "Pop" Heikes, Annie Oakley, and Frank Butler made newspaper headlines. According to Hinman, when Doc Carver was thought to have been blinded in a shooting accident in 1887 (he subsequently recovered), he received thousands of sympathetic letters from fans all over the country.

Trapshooting remained a highly visible sport until well into the 20th century. A new generation of heroes and heroines emerged, among them Fred Gilbert, Frank Troeh, Bill Heer,

Les German, Ad and Ada "Plinky" Topperwein, and Montana's own E. W. Renfro. A rancher from the tiny southwestern Montana town of Dell, Renfro won the Grand American Doubles Championship at Vandalia in 1930, and also posted the highest doubles average in the nation that year. But he is perhaps most famous for his domination of the European live pigeon shooting circuit—the "Tir aux Pigeons de Monaco"—in 1931. Competing against some of the finest shots in the world, Renfro capped his triumphant one-year tour of Europe by winning the World's Live Pigeon Shooting Championship at Monte Carlo. He was far and away the leading money winner on the 1931 circuit, and returned to the United States 131,000 francs (nearly \$20,000

in 1931 currency) richer than when he left!

Despite his success on the Continent, Renfro never returned to Europe, preferring instead to shoot in the United States and work on his ranch in southwestern Montana. He virtually dominated trapshooting in Montana from 1918 until the mid-1940s, winning seven singles titles, five handicap titles, and nine doubles titles. He was all-around champion an amazing 15 times, winning this title every year from 1930 to 1939.

The national record book notes that Renfro's long run of 240 targets without a miss at handicap trap stood unchallenged for 40 years. And, he repeated his 1930 feat of holding the highest doubles average in the nation in 1933 and 1936. He made the first-string all-American trapshooting team seven times between 1928 and 1936, and was inducted into the Amateur Trapshooting Hall of Fame in 1974.

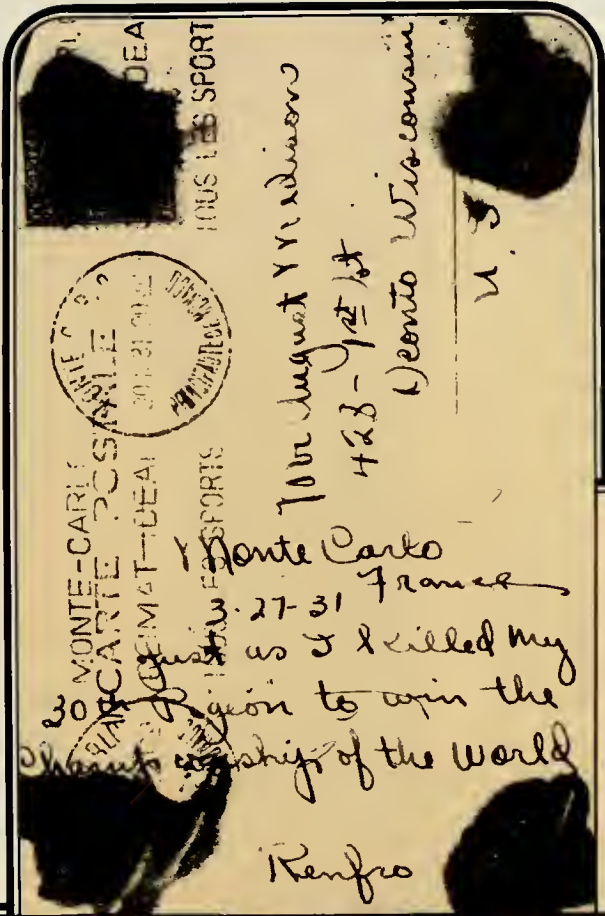
Although Renfro persevered as a force to be reckoned with up until World War II, in the late 1930s and early '40s, other Montana shooters were giving him a hard run for his money. Most notable among them were Joe Latimer and Robert Poore of Butte, and Herman R. Peterson of Dillon. Poore was one of Montana's finest trapshooters, winning 14 state titles (not counting junior titles) before retiring from active shooting. Peterson, whose 13 state titles spanned 28 years, served as president of the Amateur Trapshooting Association in 1959—the only Montanan to be so honored. Mrs. D. Gay Stivers and Mrs. A. J. Davis, both of Butte, divided the women's trapshooting honors in the period leading up to World War II, with five and four state championships, respectively.

In the late 1940s and 1950s, some new names began to appear with regularity in the Montana trapshooting record book. Names like Hugh Crossen of Gardiner, who won five state titles and is the only Montanan ever to win the Grand American Handicap Championship at Vandalia, a feat he accomplished in 1947; and Gladys Brouse of Livingston, who garnered six state women's titles between 1941 and 1954. Other notable shooters of that

period included Ada Agen of Shelby, A. A. Arras of Cut Bank, E. H. Berg of Billings, Nate Mane of Lewistown, E. J. Moore of Great Falls, and Phyllis Wright of Butte. The 1950s also saw the beginning of a remarkable nine-year domination of women's trapshooting by Margaret Brown of Great Falls, who won the state women's championship *every year* from 1957 to 1965.

The 1950s ushered in a new era in Montana trapshooting, when a gentleman named Zip Eaton of Helena took up the game for the first time. After winning the state singles championship in July of 1959, he traveled to Vandalia to compete in the Grand American. There he was part of a five-man singles squad—which, incidentally, also included Herman R. Peterson of Dillon—that set a world record by posting a perfect score of 500 out of 500 targets. This record stood unchallenged until 1983, when another squad duplicated the feat.

In 1961, Eaton won the state singles, doubles, and all-around titles, and in 1965 he won *all* the events—something only one other shooter in the history of Montana trapshooting has accomplished (you



E.W. Renfro of Dell, Mont., penned this postcard after winning the World's Live Pigeon Shooting Championship at Monte Carlo in 1931. In the early 1900s, Montana State Trapshooting Tournaments were held in conjunction with state fairs. The photo below, taken at the Lewis and Clark County Fairgrounds in Helena, shows shooters assembled for the state tournament in 1912.



guessed it, E. W. Renfro). Eaton's total score of 391 out of 400 tied the state record set in 1932 by—you guessed it again—E. W. Renfro. In 1980, Eaton broke 2,465 of 2,500 singles targets he shot at over the course of the shooting year—sun, rain, wind, or snow—for an average of .986 percent. To the best of this writer's knowledge, this is the highest singles average ever held by a Montanan. Eaton presently holds four state singles titles, one state handicap title, six state doubles titles, and six all-around titles, for a total of 17.

One wonders how many more titles Zip Eaton might hold today if he had begun trapshooting as a youngster, rather than in 1952 when he was already in his early 30s. In fact, he probably wouldn't have begun trapshooting at all if it hadn't been for a persistent Montana highway patrolman and trapshooter named Al Mues. As Zip tells it: "One morning Al stopped in at my jewelry store and asked me if I wanted to go trapshooting that night. I said no, I didn't think I would. But Al is the kind of guy who doesn't take no for an answer. He said, 'I'll be back at 5 to pick you up.' Sure enough, Al was at the shop at 5 and I had no choice but to go with him. If I recall correctly, I broke 19 of my first 25 targets...."

The rest is history, and Eaton, now 66, is still winning titles. At last year's state tournament in Missoula, he posted 198 out of 200 in the singles event, losing in a shoot-off for the championship to David Couch of Shepherd (when two or more shooters are tied at the end of an event, a shoot-off is held, 25 targets at a time, to decide the winner). His score of 198, however, was more than good enough to claim the veteran's trophy—in fact, it is the highest score posted to date in the veteran's division (age 65 and older), a relatively new category established in 1973.

Although Zip Eaton stands head and shoulders above the post-World War II crowd, Montana has produced many other fine shooters in recent years. The Renfro name continues to crop up all through the record book, with E. W.'s son, Ted Renfro, Jr., Ted's wife Barbara, and their son, Edmond, collectively claiming several state titles and national honors. Other fine Montana shooters include Melvin Batchelor of



The late Hugh Crossen of Gardiner, Mont., is the only Montanan ever to win the Grand American Handicap Championship at Vandalia, Ohio, a feat he accomplished in 1947.

Carter, Hazel Brann of Helena, Eugene Clawson, Jr. of Missoula, Earl Hepler of Havre, Shirley Hughes of Grassrange, Dan Lineback of Billings, Dale Patterson of Grantsdale, Joe Petroni of Butte, Ernie Sapp of Billings, Frances Strodman of Jackson, Irene Whisenant of Darby, Fred Wright of Victor, and Wally Zobell of Jackson.

This list is far from complete, and it does not include many of the fine people who have given generously of their time, effort, and money for the betterment of the sport they love. Foremost among them would be U. S. "Sherm" Cowan of Billings who has been on the board of directors of the Montana State Trapshooting Association every year save one since 1950, and who served as president

nine times; and John Delano of Helena, who served as secretary-treasurer of the association for 20 years.

Neither does the list include the many hundreds of Montanans who don't shoot registered targets at all—who go to the trap range merely for enjoyment and to sharpen their bird hunting skills. For in the final analysis, trapshooting is not a competitive sport in the sense of besting one's opponents, and the record book is not the be-all and end-all of the game. Each individual competes primarily against himself, attempting to achieve a personal best and to better the score shot last weekend, last month, or last year.

One of the primary attractions of trapshooting is that it can be enjoyed

by young and old alike. The lightning reflexes of the young can give them an advantage at times (witness Edmond Renfro's state singles and all-around wins in 1973 at the age of 16), while the savvy and experience of shooters longer in the tooth can prevail on other occasions (witness Al Mues' state handicap championship in 1983 at the age of 75).

And, although many millions of shotgun shells are fired at clay targets each year, trapshooting is a safe sport. Joan Davis, senior editor of *Trap & Field* magazine, reports there has never been a fatality at a registered trapshoot. She attributes this remarkable record to the fact that the safety rules are strictly enforced at all trapshooting clubs around the country, and to the many excellent programs that teach young people firearms safety. So whether your preference is a casual round or two of trap on a Sunday afternoon, or a run at the wonderful records of E. W. Renfro and Zip Eaton, trapshooting can be a game for you.

Who was (or is) Montana's greatest trapshooter? It is a question that can-

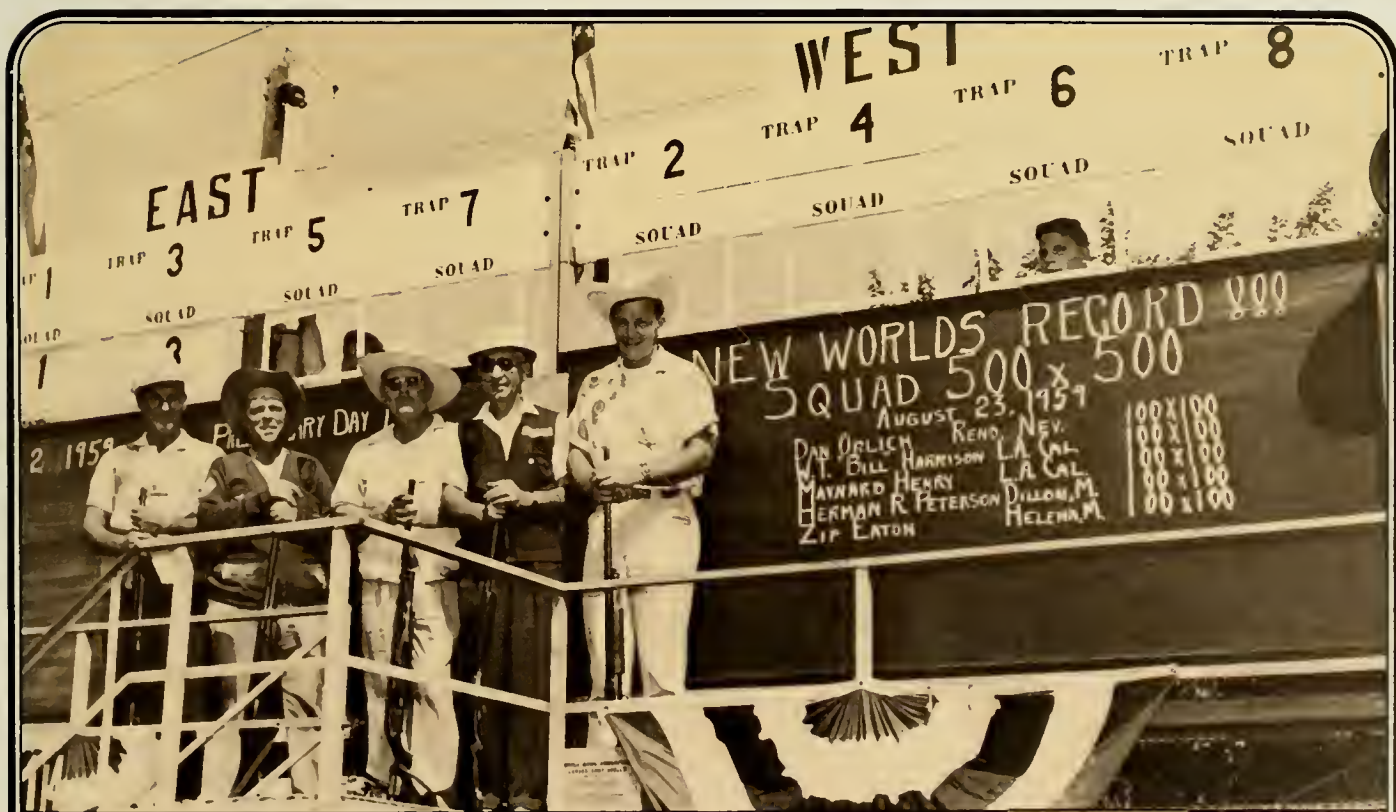


The late E.W. Renfro (right), who dominated trapshooting in Montana from 1918 until the mid-1940s, receives an award in 1964 in recognition of his many trapshooting achievements. Handing him the award is Rod Nick of the Helena Gun Club.

not be resolved, any more than we can decide between a Babe Ruth and a Henry Aaron, or a Pete Rose and a Ty Cobb. They competed at different times under different conditions. But wouldn't it be fun to see E. W. Renfro and Zip Eaton in a shoot-off? It is the stuff of friendly arguments and trapshooters' dreams. Get your bets down, friends—it's anybody's guess. Or better yet, pick up your shotgun and head for the trap range to smoke a few clays of your own.

* * * * *

I am grateful to the following individuals and organizations for their help in providing the information and photographs in this article: Lem Deskin, John Delano, and Rodney Nick of Helena; U. S. Cowan of Billings; the Helena Gun Club; the Montana State Trapshooting Association, Jack Benson, president; and Joan Davis, senior editor of Trap & Field. While the assistance of these individuals is greatly appreciated, I accept sole responsibility for errors or omissions in the article.—Dave Books



The squad of trapshooters pictured above set a world's record at the Grand American Trapshooting Tournament in Vandalia, Ohio, in 1959. They posted a perfect score of 500 out of 500 targets in the singles event. Left to right, the shooters are: Zip Eaton, Helena, Mont.; Herman R. Peterson, Dillon, Mont.; Maynard Henry, Los Angeles, Calif.; W.T. Harrison, Los Angeles, Calif.; and Dan Orlich, Reno, Nev.

SMALL HYDRO:

Old Idea, New Problems

by Al Elser

illustrated by Harvey Eckert

The trio of sun, water, and wind have served man since time began. The sun has warmed our bodies and lifted our spirits. The gurgling sounds of a mountain stream have refreshed our thirsty souls. And wind, as an old-timer once told me, "blows all those cobwebs off; it opens the dark recesses of your subconscious to new thoughts."

Members of the trio have served man well. So, it's not surprising that we would call on them when times got tough. Remember the block-long lines at the gas pumps, the threat of \$2-per-gallon gas? Remember the energy crunch of the '70s that caught many of us cold and unprepared? Where did we turn for solice? To the mighty trio of natural renewable energy: sun, water, and wind.

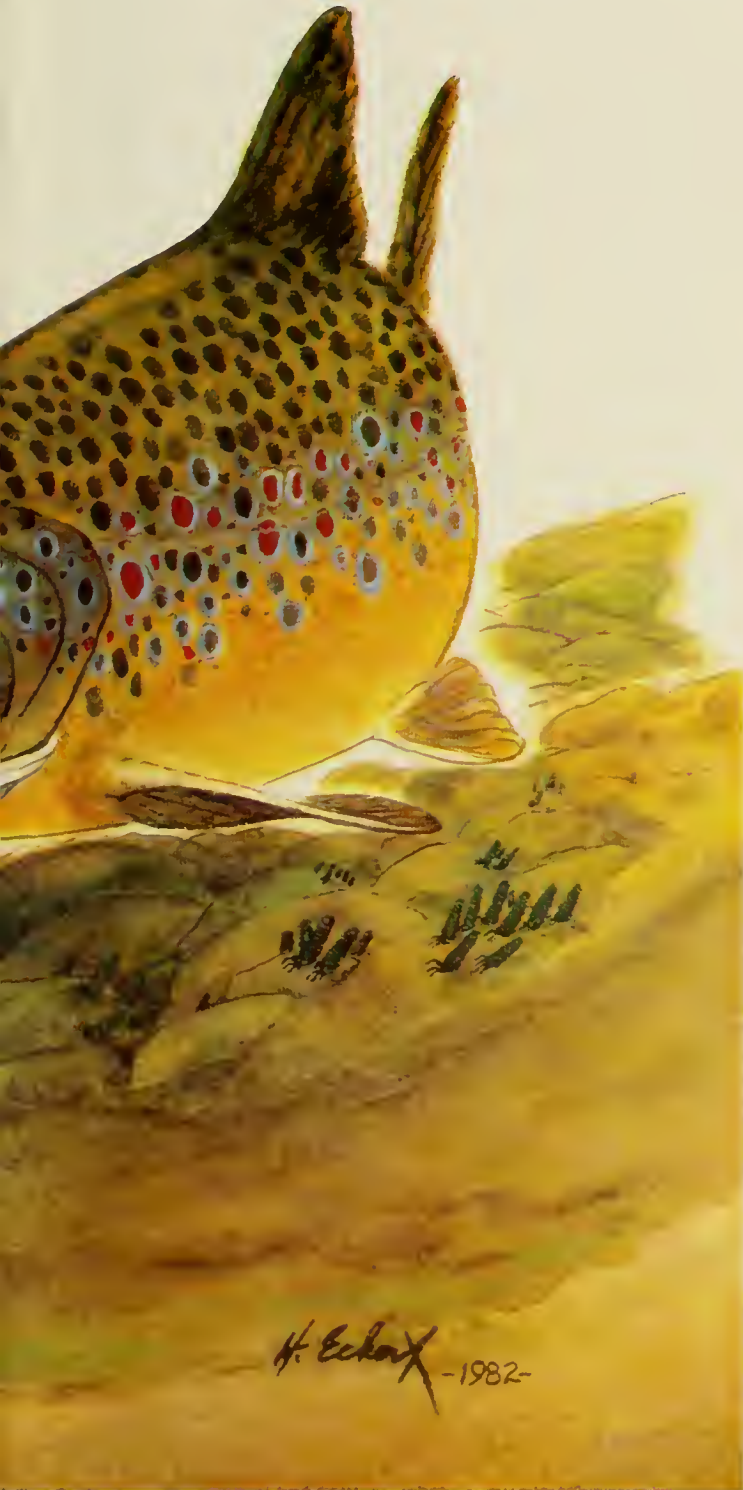
Solar panels sprouted from rooftops, and passive solar homes harnessed that free, clean, natural energy. Active solar installations oriented toward the south provided alternatives to escalating energy costs and pushed the United States toward energy independence.

Just beyond a canyon notch that funnels the winds of the Paradise Valley into Livingston, a wind farm took shape. Windmills quietly churned, changing the force that keeps Livingston the wind capital of Montana into the



stuff that microwaves our food and lights our homes. Wind-powered generators now appear in many windswept spots around the state.

Water played its part too, as small hydroelectric generation facilities were designed for mountain streams. Here, constantly moving liquid spins a waterwheel, creating its share of the new energy. But there's a difference. Small-scale hydropower projects, unlike solar and wind power, are often associated with significant environmental impacts.



From the start, America put rivers to work. In the 1600s, European explorers boated upriver to gain access to the uncharted hinterlands. Early settlements were based on river banks, where transportation, water, and a ready supply of food could be guaranteed. After the West was opened, miners hunted gold in riverbeds, and deserts were made to bloom by channeling the river's water to them. While rivers have helped fuel the American economy, a steep price has also been paid in social conflict in determining who should reap the benefits. The current controversy about small hydropower development is no exception.

Production of electricity by harnessing the energy of our cascading mountain streams is not a particularly new idea. An old-timer from the Gallatin Valley told me recently about a small hydro plant that has supplied all his electricity needs and those of his father before him—a period dating from the 1880s. The amazing fact was that the technology was almost identical to modern applications. Recent interest began in earnest in northwestern Montana in 1981 when hydropower speculators initiated a flurry of activity. Economic incentives provided by federal legislation to encourage alternative energy forms created a speculative atmosphere.

Current hydro activity in Montana falls into two categories: (1) new diversions, and (2) installations on existing facilities (retrofits). Some of the projects which take advantage of existing facilities pose very little threat to the environment. Retrofit technology demonstrates some innovative thinking, with existing dams, irrigation diversions, and canal drop structures under study as possible energy producers. With these types of projects, initial cost is much less, since the basic structure is already in place; often the operational scheme depends on existing water flow patterns, thus reducing impacts to fish; and associated facilities (e.g., transmission lines, roads, stilling basins) are already in place, reducing potential environmental disturbance.

But most proposed small hydropower development in Montana involves new diversion. Such projects typically channel flow into a penstock, a long pipeline which carries water to a powerhouse. The penstock, which may range in length from several thousand feet to several miles, serves to maximize elevation before the water falls into the turbine. To provide maximum hydraulic head, a large proportion of the stream flow is generally diverted through the penstock rather than left in the stream channel.

The Regulatory Process

The Public Utilities Regulatory Policy Act (PURPA), enacted in 1978, was the first major amendment to the Federal Power Act in many years. Passed at a time of national energy hysteria, PURPA was intended to promote alternative forms of energy development. Several conditions established by PURPA are aimed at benefiting small-scale, renewable energy producers. Utility companies are required to purchase the energy produced by the "little guy." But further, they are required to pay the "full avoided cost." This can be defined as a rate equal to that which the utility would have to pay to develop new or to purchase additional power. Add to this tax incentives and financial breaks, and the bottom line is an offer that small hydro entrepreneurs couldn't refuse: a guaranteed market, and a

guaranteed price.

Montana's Legislature passed its own version of PURPA in 1981, which stipulates that utility companies will purchase electricity at a rate established by the Public Service Commission. Currently, Montana Power Co. is required to pay 7.2 cents per kilowatt-hour, for a 35-year contract.

The Federal Energy Regulatory Commission (FERC) has licensing authority over non-federal hydro projects. (Federal projects and projects designed for individual use are exempt under provisions of the Federal Power Act.) Let's take a hydro project through a typical permitting sequence.

Developers must first apply to FERC to obtain a preliminary permit. Once received, the preliminary permit provides prior and exclusive rights to the specific site. Preliminary permits are generally issued for 18 to 36 months, thus allowing developers time to complete the license or exemption application. During this time, engineering, economic, and environmental studies are conducted. Developers must consult with the state wildlife agency as a requirement under the Fish and Wildlife Coordination Act and FERC rules and guidelines.

When the necessary studies and consultations have been completed, the developer may submit an application for licensing to FERC. Topics such as project location, operational plan, economic analysis, and environmental impacts must be addressed in the application. Once again, FERC reviews the application and can: issue the license as submitted, deny the license, or attach specific conditions as part of the license. For projects producing less than five megawatts of power, the developer may choose to apply for an exemption from licensing. The exemption process requires similar information, but less paper work and "red tape."

During the licensing or exemption process, a number of state permits are also required. A water use permit must be obtained from the Department of Natural Resources and Conservation; the Department of Health and Environmental Sciences must certify that water quality standards will not be violated. A Natural Streambed and Land Preservation Act permit (called the "310 permit," after the number of the act) is required from the local Board of Soil and Water Conservation District Supervisors. The number of permits required is a reflection of the potential level of impact which might result from the development.

Environmental Impacts

Impacts associated with small hydro projects vary greatly, depending on design and location. Retrofit projects are relatively benign, particularly if existing flow regimens and reservoir operations are utilized. However, serious problems can result to both the stream and reservoir if operational modes are altered to meet power peaking demands.

Hydro projects on high gradient tributary streams are a different matter; they can be devastating to aquatic resources and can also affect terrestrial species. Diversion of water into the penstock can reduce flow in the stream below the level necessary to support healthy populations of fish and aquatic invertebrates. Winter produces a harsh environment under normal flow conditions, and further flow reductions at this time can cause extreme stress to fish populations. Dewatering can also eliminate crucial spawn-

ing areas or block spawning migrations.

Even if fish can negotiate the project area, the diversion may adversely affect their movements. Barriers to migration patterns are a key concern, since trout populations in many large rivers and lakes depend on the success of adult fish moving into tributaries to spawn. Water quality is also jeopardized during the construction phase, and by diversion structures acting as sediment traps necessitating periodic flushing. Construction of associated facilities, such as roads, penstocks, powerhouses, and transmission lines, has potentially adverse impact on terrestrial values.

The involvement of the Department of Fish, Wildlife and Parks in the FERC process most often comes to a head in discussions relating to instream flows. Developers want as much of the available water as possible to maximize power generation, while DFWP's primary concern centers on the amount of water that must bypass the diversion and remain instream (bypass flow) to protect the fishery. Investigations are conducted to determine the value of the fish populations residing in the project area. Channel measurements are taken and, based on a "state-of-the-art" methodology involving computer simulations, bypass flows are recommended. Either FERC (on licenses) or DFWP (on exemptions) has the authority to stipulate the amount of water that must remain instream, rather than being diverted into the penstock. Once this flow is established, it must bypass the diversion before any water enters the penstock. If flow falls below the bypass amount, then all water must remain in the channel.

Another fisheries-related question is that of cumulative impacts. Many of the initial proposals were clustered in a few drainages. A study funded by Bonneville Power Administration is looking into the question of how several small hydro projects might impact the Swan River drainage. The Swan was selected not only because of 20 proposed hydro projects, but also because the Swan tributaries are important bull trout spawning and nursery streams. Early indications are that many of the hydro sites could have a significant impact on this important fishery.

Small-scale hydro activity hit Montana like a linebacker for the Packers keying in on an unprotected quarterback. During the summer of 1981, an avalanche of FERC applications was initiated on streams in northwestern Montana. Since the first volley, interest has been shown in developing small hydro projects in most mountainous areas of the state. At one time, there were over 100 active applications for 88 sites winding their way through the application process. At last count, there were 68 active applications for permits on 61 sites. Many preliminary permits have been issued by FERC, only to be voluntarily relinquished after economic analysis found the projects to be unsound.

Despite all the applications, only three sites are on line. Facilities have been installed on the Philipsburg and Whitefish municipal water supplies, and a small project is operational on Cascade Creek in the upper Yellowstone drainage. The paucity of completed projects indicates that even with incentives, small hydro isn't as lucrative as many people had hoped it would be. However, several developments are in advanced stages of planning. These include projects that have minimal environmental concerns, such as retrofitting of existing dams (Cooney, Tiber, and

continued on page 14

The Catchall

Please Fill In The Blanks

It's a fact—nobody likes questionnaires, particularly those who receive one in the mail along with a request to fill it out. Dealing with questionnaires is usually not a favorite activity for the sender either. But to manage a sport fishery, it is necessary to have a good idea of how many people are fishing and on what waters they are trying their angling skills. This knowledge guides the Department of Fish, Wildlife and Parks both in applying and evaluating management measures.

The alternative to questionnaires is on-site surveys, usually in the form of creel censuses. Anglers are checked either while they are at a fishing site or, in the case of a check station, when they are leaving. On-site surveys are excellent, but very expensive. The cost for conducting one during an entire fishing season on a single water is almost never less than \$5,000 and may cost several times that depending on the size of the water and number of fishing access points.

Using questionnaires would be fairly easy if fisheries researchers could wait until the end of the year and then send a questionnaire to a sample of fishing license holders asking where they fished and how many days on each water. This doesn't work for Montana fishermen. For the 1982-83 fishing year, the average fisherman responding to our questionnaire fished 15 days on Montana's streams and lakes. It would strain anyone's memory to try to recall all of those trips and waters.

The department's solution has been to send questionnaires in waves. Each month, some Montana fishermen are asked where they fished during the past month. Out-of-state fishermen who fish on a temporary license generally can remember where they fished, so they are sent a questionnaire for the whole year.

Nothing is perfect—and that includes the fishing pressure survey. The statistical theory is sound, but there are always problems. As an example, names and addresses of fishermen are obtained from copies of licenses. When license dealers are late in sending them in, these areas are not adequately represented in the sample. Another consideration is non-response. This is not a problem if a large majority return the questionnaire. If not, can we assume that the average for those who *did* respond represents the average for those

who did not? The greater the non-response, the less sound this assumption becomes.

We know where the problems are and are constantly making improvements. The results for May 1982 through April 1983 look reasonably valid. Here are the top 25 waters in terms of fishing pressure (a man-day is a fisherman visit, however short or long, to a water during a calendar day):

included will be maps of some streams so the person answering can designate the section he or she fished.

Questionnaires are sent to only a fraction of those who fish Montana's waters. So if you receive one, please fill it out. We try not to impose on you too often—and when we do, it is because we really need the information.—*Bob McFarland, computer programmer, Fisheries Division*

Water Name	County	Fisherman Days
Canyon Ferry Reservoir	Lewis and Clark	118,290
Flathead Lake	Flathead, Lake	103,880
Holter Lake	Lewis and Clark	94,056
Madison River Sec 02	Madison	83,164
Clark Canyon Reservoir	Beaverhead	69,893
Hebgen Lake	Gallatin	67,198
Georgetown Lake	Granite, Deer Lodge	53,660
Yellowstone River Sec 08	Park	47,982
Lake Koocanusa	Lincoln	45,379
Madison River Sec 01	Gallatin, Madison	42,741
Hauser Lake	Lewis and Clark	42,578
Gallatin River Sec 01	Gallatin	40,781
Madison River Sec 03	Madison	38,195
Big Hole River Sec 02	Beaverhead, Madison	37,540
Bitterroot River Sec 01	Missoula, Ravalli	35,723
Kootenai River	Lincoln	35,206
Yellowstone River Sec 01	Richland, Dawson	35,085
Missouri River Sec 09	Cascade, Lewis and Clark	34,938
Bighorn River Sec 02	Big Horn	34,633
Beaverhead River	Beaverhead, Madison	34,207
Missouri River Sec 08	Cascade	31,773
Clark Fork River Sec 02	Sanders, Mineral	30,753
Stillwater River Sec 01	Stillwater	30,598
Flathead River Sec 02	Flathead	29,640
Jefferson River	Jefferson, Madison	25,620

In all, estimates were obtained for 1,408 waters (20 fisherman-days was the lowest usage). Total cost of the survey was about \$30,000, or about \$22 per water—a bargain *and* a great savings over on-site surveys.

We are continuing the pressure survey this year but with a new look. We need to know more about catch rates (fish caught per hour) and harvest statistics. This means there will be more questions asked: what kinds of fish you caught, how many, the number of fish kept, and the total hours fished. To help avoid failing memories, we will send out questionnaires twice a month rather than monthly. Also

Ear Protection: A Must For Shooters

Approximately 20 million Americans suffer some form of hearing impairment, and 10 million of these people have a noise-induced hearing loss. Excessive noise is the major cause of hearing loss in the work place and in the military, and more recently, in our recreational pastimes. Activities like trail bike riding, snowmobiling, pistol and rifle shooting, firewood cutting with a chain saw, and trapshooting can slowly destroy your hearing if appropriate precautions are not taken.

continued

The human ear is capable of hearing a wide range of different loudnesses and pitches. We are able to hear a light rainfall of about 15 decibels, or a jet aircraft taking off at a loudness of 135 decibels. Sounds of 85 decibels or more may be dangerous to one's hearing over prolonged periods. Noise may be continuous, such as machinery noise in a factory, or impulse, such as a gun blast. Continuous noise over a long period will slowly destroy the hearing, but impulse noise can cause hearing loss much more quickly. Sound will usually become painful when the loudness reaches a level of 120 decibels; a typical shotgun blast has a loudness of 140 decibels.



At first, exposure to loud noise produces a temporary hearing loss; it goes away after the ears have had a chance to rest. But if exposure continues day after day, year after year, the hearing loss becomes permanent and nothing can bring it back. The damage occurs within the inner ear, where there are thousands of tiny organs called hair cells. These hair cells sense the sounds coming from the middle ear and eardrum, turn them into nerve impulses, and send these impulses to the brain, which interprets them as high or low pitches and soft or loud noises. If the sounds coming into the ear have been too loud for too long, these hair cells become damaged. The person whose ears have been damaged to this extent will have difficulty carrying on a conversation. He often misunderstands what others have said. Someone asks him about his car: "What kind is it?" He thinks the question was, "What time is it?" and his answer, "Half past 10," is embarrassing.

Ear Protection

Obviously, nobody wants to acquire a hearing loss of this nature, so ear protection is very important. A number of protective devices are available, including premolded rubber plugs, expandable

foam plugs, putty-like substances, custom-made plugs, and earmuffs of several types.

Ideally, you want your ear protection to be comfortable, and also to provide maximum protection. Since every ear is unique in size and shape, it's easy to assume that custom plugs will be the most effective in attenuating noise. But recent studies have shown that custom earplugs, despite their higher cost, do not necessarily provide the greatest protection. For activities with high impulse noise—such as pistol, rifle, and shotgun shooting—the product with the greatest noise attenuation is recommended. Usually this will be a fluid-filled earmuff or a combination of earplugs and earmuffs. If earmuffs are too restricting, one of the foam-type earplugs is recommended. Cotton, although it attenuates some sound in the higher frequencies, does not protect your ears adequately from damaging noise.

Warning Signals

There are several good indicators which may suggest that you are losing your hearing due to noise exposure. You should have your hearing checked if:

- (1) You find that loud noise causes your ears to ring.
- (2) You have a hard time hearing for awhile after leaving a noisy room.

What Can Be Done?

If you already have a hearing loss, make sure there are not other reasons for it besides noise exposure. There are many causes for hearing loss, and more than one can affect your hearing at the same time. A thorough medical and audiological examination is essential. Some types of hearing loss can be treated with surgery or other medical procedures, but if these treatments are ruled out, a hearing aid may be beneficial. An ear specialist known as an otolaryngologist or an audiologist will be able to conduct tests to determine if a hearing aid will help. Success depends on the degree of hearing loss, where the deficiencies are, how long the deterioration has been going on, and a number of personal factors that vary widely from person to person. Even the best hearing aid is only a tool to enhance hearing and understanding, and will not restore damaged hearing.

The best practice is to protect your hearing whenever you are exposed to excessive noise. It's one of the wisest and least expensive investments in your health that you will ever make.—*Larry Wundrow, M.S. audiologist, Missoula Hearing, Inc.*

Federation Honors Two

The Montana Wildlife Federation's top awards this year went to Arnold Rieder,

Boulder, and Al Jenkins, Billings. The awards were presented at the group's annual convention in Lewistown in May, at which Ben Dysart, president of the national federation, was among the featured speakers.

Rieder was presented the Mello-Ohrmann Conservationist of the Year Award. A Boulder area rancher and former state legislator, Rieder served on the Fish and Game Commission from 1970 to 1975. From 1951 to 1965, he served in the Montana Legislature, first in the House and later in the Senate. He served on the Fish and Game committees in both houses and was chairman for three sessions. He also was behind Montana's first hunter safety act; passed in 1957, it made Montana the first western state to have such a bill.

Jenkins received the Fred Carver Sportsman of the Year Award for his promotion of sportsmen's rights. He has served as president of the Billings Rod and Gun Club for many years and has been involved in efforts to benefit sportsmen throughout the state, including the successful battle to open the Bighorn River to fishermen.

Montana Olympic Hopefuls

To say that competitive shooting has been a successful family tradition in the Wigger household is perhaps the understatement of the year.

Indeed, it is difficult to find a superlative to adequately describe the shooting success of Lt. Col. Lones W. Wigger. A pre-eminent figure in national and international competition, he has been selected to 18 U.S. Shooting Teams, four of which have been Olympic teams. During his shooting career, he has collected two Olympic gold medals, 27 world records, 55 gold medals in international competition, and 71 national titles—a truly incredible achievement for any American athlete.

This past summer at the IX Pan American Games in Caracas, Venezuela, Wigger earned eight more shooting medals, boosting his collection of gold, silver, and bronze medals to 93. His current goal is earning a place on the 1984 U.S. Shooting Team which will represent the United States in the 1984 Olympics.

A 45-year-old U.S. Army lieutenant colonel, Wigger believes that perseverance, not talent, has been the key to his shooting success. "I've never been gifted with a lot of talent," he claims. "I probably succeeded because I persevered. I think most anybody can be a champion in our sport if they have the desire...and will put in the work."

At just 17 years old, Deena, Wigger's daughter, has already established herself as a world class contender. During 1983, she topped a strong competitive field to

win the Women's Standard Rifle Prone Championship, establishing her as a national champion in this event and a member of the 1983 U.S. Shooting Team. Miss Wigger took another gold medal at last year's National Sports Festival, where she won the Women's Standard Rifle event.

In international competition at the IX Pan American Games, she once again took top honors, winning the gold medal in the Women's English Match and setting a new Pan American record for her score.

"There are two things you should know about Deena," says her father. "One, she likes to win and, two, she doesn't like to lose. She can be the best if she decides that is what she wants to do."

In discussing her shooting success, Miss Wigger notes that "I like to think I've done a lot of it on my own. My father supports me and gives me advice if I ask for it but doesn't coach me much. We have a father-daughter relationship, not a shooter-shooter.... I came back [to shooting] because I wanted to get more involved with my family. Besides," Miss Wigger says, "this year, for the first time, women will have their own shooting events in the Olympics, and I want a gold medal."—*National Shooting Sports Foundation*

• *The Wiggers are formerly from Carter, Mont. Other hopefuls for the U.S. Shooting Team in the 1984 Olympics who have Montana backgrounds are Pat Spurgin, an 18-year-old Billings shooter, and 29-year-old Wanda Jewell, formerly of Great Falls.—Ed.*

Wildlife Officers Organize

On July 12, 1980, 16 fish and wildlife enforcement officers from Montana, Idaho, Wyoming, Saskatchewan, Alberta, and British Columbia met in Great Falls, Mont., to explore the potential for creating a professional organization of North American wildlife enforcement officers. For years, common needs and goals had been discussed by officers from many jurisdictions; however, no single organization had evolved to provide an adequate voice or representation for wildlife officers throughout the continent. As a result of lengthy discussion and planning by these original 16 delegates, the North American Wildlife Enforcement Officers Association (NAWEOA) was born.

Today, four years later, NAWEOA has more than 3,000 members, mostly from state and provincial wildlife enforcement agencies, but some from the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Canadian Wildlife Service, and the Canadian Department of Fisheries and Oceans as well. In all, 43

jurisdictions throughout North America are represented. The success of NAWEOA can be better appreciated when one realizes that all its officers are full-time law enforcement personnel who volunteer their time to the organization. Members pay their own dues and in nearly all cases travel to annual meetings and winter executive meetings without financial assistance from their agencies.

(3) To encourage and promote the professional development of wildlife enforcement officers in North America.

(4) To encourage and develop high standards and practices of professional wildlife law enforcement.

(5) To encourage and develop camaraderie and "esprit de corps" among wildlife enforcement officers throughout North America.



Tom Bivins, left, warden from Choteau, is president of the North American Wildlife Enforcement Officers Association, and Gene Clark, warden from White Sulphur Springs, is the group's secretary-treasurer. Formed in 1980, the association now has over 3,000 members from state, Provincial, and federal organizations. The patches pictured are from some of the association's member agencies (DFWP photo: Tom Warren).

Although wildlife law enforcement has always been a difficult and demanding job, in the past 20 years or so the profession has changed significantly. Almost all states and provinces now require law enforcement officers to have a four-year degree from a university or at least a two-year technical degree in wildlife conservation. In addition, new officers must acquire 600 to 1,000 hours of law enforcement training during their first few years on the job, and all officers continue to receive formal training at intervals throughout their careers. The fact that today's wildlife officers are true professionals who play a critical role in natural resource management is not widely understood and appreciated by the public, and NAWEOA's founders kept this in mind when they wrote the following organizational objectives:

(1) To maintain an association of wildlife and fisheries enforcement officers within the continent of North America.

(2) To endeavor to secure a greater degree of recognition in the vocations for members of the association.

(6) To encourage and promote personal and professional liaison and cooperation among wildlife officers in North America.

(7) To encourage and provide opportunity for discussion of common and unique problems facing all wildlife enforcement officers throughout North America.

(8) To provide encouragement and support to all members in their professional endeavors.

These objectives are part of a major goal of stimulating wildlife enforcement officers' ongoing professional dedication to protecting the fish and wildlife resources of North America. Some examples of NAWEOA's activities include assisting interested wildlife agencies with the formation of "crimestoppers" reward programs for gathering information on game law violations, and establishing a wildlife officer exchange program in which officers work temporarily in different jurisdictions to increase their knowledge of law enforcement techniques. In 1984, a NAWEOA grant enabled an officer from Idaho to travel to

Ontario for this purpose, and an officer from Manitoba was able to spend time working with his counterparts in Texas.

Montana law enforcement officers have played an important part in the creation and ongoing operation of NAWEOA. Of the 16 original founders, five were Montana game wardens. Two Montana wardens have served on the board of directors and two are currently serving as officers. Tom Bivins, game warden from Choteau, is the organization's president, and Gene Clark, game warden from White Sulphur Springs, is secretary-treasurer.

The 1984 annual convention, scheduled in August at Whistler, British Columbia, is expected to attract over 200 officers from more than 20 states and provinces. This will probably be the largest gathering of wildlife law enforcement officers in the history of North American conservation. It is obvious from the tremendous growth of NAWEOA that Canadian and American wildlife officers not only want, but cherish, a professional association where they can meet with other officers, discuss common problems, initiate projects, and promote the stature of their profession, all for the common goal of protecting North America's unexcelled fish and wildlife resources.—*Tom Bivins*

Book Review

FISHING YELLOWSTONE WATERS, by Charles E. Brooks and J. Daniel Callaghan, New Century Publishers, Inc., 220 Old New Brunswick Road; Piscataway, NJ 08854, 1984, 160 pages, \$19.95, hard cover.

The title of this book says it all: "Fishing Yellowstone Waters" is a "roadmap" to the extraordinary trout fishing of Yellowstone National Park and surrounding areas. But it's the prettiest and most literary roadmap you will ever find. A happy marriage between Charles Brooks' knowledgeable writing and Dan Callaghan's artistic black-and-white photography, this book is the first detailed fisherman's guide to the area.

Brooks, a resident of West Yellowstone, Mont., knows every hole and riffle in the streams and rivers of this area; he makes the reader feel as if he were walking right along behind, watching over the master's shoulder. Callaghan has obviously been there; he has the pictures to prove it. And beautiful pictures they are, of Yellowstone's fabled waters, of fish and fishermen, and of the area's abundant wildlife.

Chapters in the book are like signposts to a trout fisherman's paradise: Gardner River, Lamar River, Firehole River, Madison River, Gallatin River, Henry's Fork, Yellowstone River, to name a few.

Callaghan includes a section called "Photographer's Notes" at the end of the book, enabling the reader to learn something about photography as well as trout fishing.

As Brooks points out, fish are not always easy to catch, even in this magical land of geysers, bison, and trout. But if you don't catch them, it won't be Brooks' fault, because he covers in detail the waters, the fishing techniques, the insect hatches, the best flies to use and when to use them.

If you're planning a trip to the Yellowstone area, this book could be the most valuable piece of fishing paraphernalia you'll take along.—*Dave Books*

Small Hydro

continued from page 10

Painted Rocks); utilization of irrigation systems that produce hydraulic head (Turnbull Drops on the Fairfield Bench, Mill Ditch on Big Spring Creek); and diversion of streams not important to

Wildlife Shorts

Diving ducks have specialized body parts for swimming and diving. Their legs are located toward the rear of their body.

* * * * *

Crossbills do, in fact, have crossed bills. The bills aid in extracting the seeds of pine cones for food.

* * * * *

There are nearly 1 million known animal forms on earth.

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Since the days of ancient Greece, man has used the fibrous skeletons of the sponge for bathing, washing, and other cleaning tasks.

* * * * *

Mark Twain's humorous story, "The Celebrated Jumping Frog of Calaveras County," was the basis for an annual jumping frog contest now conducted at Angels Camp, Calif.

* * * * *

Sharks depend on their olfactory sense—or their sense of smell. Two olfactory sacs on the snout are stimulated when water passes through them.—*Vince Yannone, assistant administrator, Conservation Education Division*

fisheries (Barney, Strawberry, and Cataract creeks).

Is There a Future?

As Hugh Zackheim, an associate resource scientist for the Montana Environmental Quality Council, wrote in a recent report: "A number of philosophical differences underlie the conflicting viewpoints of those promoting and those opposing small-scale hydro development." Proponents believe that high-head hydro generation is the least environmentally damaging method of providing consumers a reliable and cost-effective way of generating more electricity, because hydropower is cleaner and less damaging than technologies using fossil fuels or nuclear energy. Advocates concede that additional power is not needed presently, but feel that hydro development now is better than facilities hastily developed in panic at some future time of shortage. They also believe the intent of federal and state legislation was to promote development of alternative, renewable energy, while protecting the environment through a long and laborious review process.

Those who urge caution in small hydro development are concerned primarily with the dewatering of trout streams. Water quantity dictates the quality of these fisheries, and professionals fear that flow reductions will reduce the carrying capacity of the streams, lowering recreational opportunities. As Zackheim notes: "Opponents to small-scale hydro strongly question the need for power in view of the regional surplus of energy, and they question the wisdom of a policy which ensures that the utility companies and consumers will pay top rates for this unneeded power."

Confidence in FERC to make sound decisions on projects involving fragile and sensitive fisheries is weakened by the fact that since 1935, FERC has approved over 900 applications for license or exemption, and disapproved only one on environmental grounds.

The rationale for encouraging development of small-scale hydropower in light of energy planning efforts by the Northwest Power Planning Council is certainly open to question. Since we are in a time of energy surplus, it would seem logical to sit back and assess all of our options, picking those that best meet our needs, are least damaging environmentally, and are most favorable to both developers and consumers. There currently exists no comprehensive energy plan which addresses the need for small hydro development.

Small hydro may have a place in our energy future, but until that place is defined and safeguards built into the regulatory system, wholesale promotion of small hydro appears premature. ■

The Lewis and Clark Expedition of 1805-06 still amazes naturalists with the amount of scientific and geographical information recorded in its journals. But apparently, the Corps of Discovery passed through Montana without noting any agates—one of the few things it missed.

This is understandable, considering that the expedition divided and William Clark made a hurried trip down the Yellowstone, taking about eight days from Pompey's Pillar to the mouth of the river. While passing through this agate country, he was plagued by mosquitoes, wind, thunderstorms, herds of buffalo blocking the river, and the constant threat of grizzly bears and hostile Indians. Rocks creating rapids in the river were of more concern than those decorating the bank. However, Clark commented on the layers of coal visible along the river, the brown rocks of Buffalo Rapids, and the red stones thrown out by the current of the Powder River.

Artifacts found in eastern Montana dating to prehistoric times are often made of agate, as well as chert, porcellanite, flint, and other materials. The Indians and their ancestors knew about agates, and used them in making arrowheads and scrapers.

Exactly when the white man discovered agates along the Yellowstone is not known, but one of the earliest recorded observations was made in 1872 by a military escort provided for engineers surveying a route for the Northern Pacific Railroad. In "The Plainsmen of the Yellowstone," a history of the Yellowstone Basin, Mark H. Brown writes that Colonel David S. Stanley and an escort took the engineers to the mouth of the Powder River where they began surveying. While there, a "foolish young man named Davis...strayed off to hunt agates." Soon the young man returned—with 25 or 30 Indians at his heels. That encounter ended after exchange of a few shots. The Chief and Colonel Stanley conversed briefly about the surveying; then shots were exchanged again, with one Indian reported wounded.

Agates were also mentioned in the diary of Dr. James M. DeWolf, six days before he was killed while retreating with Major Reno in the Battle of the Little Bighorn. (His diary and other personal effects were

recovered.)

While following the south bank of the Yellowstone River downstream from the mouth of Rosebud Creek to six miles above the mouth of the Tongue River, Dr. DeWolf commented on the day's activities (June 19, 1876): "33 miles...marched 9 and 3/4 miles back from the river on the bluffs, 8 miles along river bottom, then the balance on bluffs. The last mile was dreadful badlands and almost impassable. Found lots of agates, some pretty." The following



The Rocks With The Pretty Pictures

by Pat Gudmundson



Montana agates are easy to work with, and they make beautiful jewelry, as the two pieces by the late Ed Klapmeier of Miles City show (photos: Ed Klapmeier).

day, after meeting the steamboat *Far West*, the party marched back up the Yellowstone and set off for the Battle of the Little Bighorn, where Dr. DeWolf was killed on June 25.

The Yellowstone River was a main travel route for early explorers and fur traders. Undoubtedly, many of them noticed the pretty stones on the gravel bars. But their minds were on beavers, not on rocks, and they were probably disinclined to keep diaries and record such minor observations; in fact, many were illiterate and were unable to leave a record of their trips.

Until after World War I, there were thousands of tons of agates along the river and in the nearby creeks and hills—lots of agates, but no market for them and only a mild curiosity in finding the pictures in them. People living near the river gathered agates on Sunday walks and took them home to break up with a hammer, just to look for the "trees" inside. Piles of broken pieces can still be found on isolated ridges, where a sheepherder had idled away his time breaking them.

After World War I, European gem cutters were looking for gem material. A San Francisco firm hired a man in Billings to supply agates, and he arranged for men in Miles City to gather them. In 1919 and early 1920, agates were shipped out by the carload. The firm went out of business later in 1920. Old-timers recall that the Billings and Miles City suppliers were left with thousands of pounds of agates which they stored in the basement of a Miles City saloon. They were eventually sold to some people in Huntley.

By the late 1930s, a few agate shops had sprung up along the main highway. One of the more picturesque was that of Albert Raihl; in 1935, he opened Raihl's Agate Shop about two miles east of Terry along old Highway 10. He cut and polished agates, and he piled the rough agates he had for sale in old farm wagons. He also sold curios, pioneer items, and Indian artifacts. He operated the shop until his death in 1963.

Today Montana agates—which share the title of state gem with the sapphire—are much desired by rock hounds all over the United States, Canada, and other parts of the world. People come to gather them, while others order them or make special

trips to Montana to buy them from local agate shops. Hunting and gathering them have provided many young people with funds for a college education. Interest has increased, and many people have discovered the pleasure of finding their own agates and then cutting and polishing them to make jewelry.

It's a particularly versatile hobby, because the rock hunting can be done during warmer weather; when snow and cold arrive, the rock hunter can retreat to his shop to work his treasures from the past summer. Some continue it as a hobby, while

scrape, and dig deep into the gravel, more agates may be moved to the surface. Sometimes the ice jams will even cause the small islands and gravel bars to shift.

One of the best times to hunt agates is after the ice has gone out in the spring. A little later comes the annual "June rise" when the river runoff is heavy from spring rains and melting snow in the mountains. By midsummer, the water is low again, exposing large expanses of gravel suitable for searching. Good hunting continues until winter's first snows.

Many rock hunters use boats to

of easier ways—such as arranging themselves at the intake belt of a construction company's rock-crushing equipment—but such opportunities are hard to come by. This leaves the average rock hunter with one alternative: walking. A boat, a horse, a motorcycle, or a four-wheel-drive vehicle might help, but it's always back to the basics of walking, picking up, examining, and usually discarding many more rocks than are kept.

Agates vary in size from a fraction of a pound up to 10 or 20 pounds—but there are very few 20-pounders! They are so unusual that they are not



When the Yellowstone River begins to thaw, large cakes of ice float downstream, jamming at intervals. As the huge chunks of ice roll, scrape, and dig deep into the gravel, more agates may be moved to the surface. Searching for "the rocks with the pretty pictures" are Deb Reed and daughters Heather and Shara of Miles City (photo: Jim Anderson).

others go into business and open rock shops to sell both jewelry and uncut material.

Has the supply diminished? Obviously, there are not as many agates as there once were, but agate hunters still look for and find them. The most popular place to search is gravel bars which line most shores and islands of the Yellowstone River. Fortunately for agate hunters, the Yellowstone has remained a free-flowing river and periods of high water and low water expose new stones. Also, ice usually freezes several feet deep in winter. The river runs in a northeasterly direction, and is inclined to thaw first in the upstream area. Large ice cakes float downstream, jamming at intervals. As the huge chunks of ice roll,

reach the islands and less accessible parts of the river. Agates can also be found on creek bottoms and on some of the nearby hills. Gravel pits and highway construction jobs usually turn up agates. Be certain not to trespass on private land, unless you have the landowner's permission to be there.

Rock hounds from other areas sometimes arrive in Montana with a question which amuses the natives: "Where can I dig for agates?" They are told it isn't done that way here. Walking and looking for agates on the ground's surface is the only way. This can be tiring—carrying a heavy sack of rocks while walking up a creek, around a hill, or down a river. Naturally, people have tried to think

even cut, but kept as specimens. Probably the largest known agate—almost 63 pounds—is one owned by Larry DeShaw of Savage. It was found by his nephew, Greg DeShaw of Sidney, near a creek in the Hysham area.

In general, agates are found from the Custer area downstream to Sidney, a distance of about 300 miles. Their origin is not known, but they are believed to have formed about 50 million years ago in the higher country to the southwest. They were probably washed downstream by some ancient river, since they are now found in sedimentary material.

Agates are a form of quartz, actually a form of chalcedony in the quartz family. Chalcedony more

commonly refers to "clear agate," while "agate" is the popular term for the type with "pictures."

The color and designs give beauty to the stone, and the dendritic growths and colors are created by infiltration of metallic oxides. Oxides of various metals make different colors; when both black designs and colors appear in the same stone, it is especially attractive.

Agates may be completely clear, or have spots and stripes of yellow, orange, brown, brownish-red, or almost black, and a few have green markings. Dendritic patterns appear in many of the stones, and with a little imagination one may find pictures of trees, lakes, hills, flowers, animals, and even people when the rocks are sliced by a diamond saw. It is generally believed that the agates found in the lower half of the 300-mile stretch of agate country are more colorful, but perhaps smaller, than those farther upstream.

Although translucent, agates have a rough exterior skin, making them difficult for the inexperienced rock hound to spot. Often they have a broken spot or "window" through which the translucent quality can be seen. Agates which have weathered many years in the hills may be disguised by a chalky coating, but sometimes the white coating makes agate hunting easy in the hills.

Montana agates are easy to work with and make beautiful jewelry. Lapidarists cut, shape, and polish them on special machinery, or grind and polish them in tumblers (machines which roll and vibrate the stones in the polishing material). Slabbing the rock is very important and a careful worker will study the rock thoroughly before deciding in which direction to cut. Sometimes a small slice from one end will reveal dendrites which would look better cut from another side. It is difficult to tell what a stone contains without slicing through it. If you hold it against a strong source of illumination (the sun if outdoors, or a bright light indoors), a relatively clear stone will pass light more readily than one with a great deal of marking. No two stones are exactly alike, even when cut from the same rock.

Sometimes a thin slice of agate shows a rainbow of iridescent colors

when held toward the light. This is called an "iris agate" or sometimes "rainbow agate." It is impossible to tell an iris agate without cutting off a thin slice and holding it to the light because the iris quality is occasionally found in the uninteresting "clear agate."

Jewelry is not the only use for agates. Many rock hounds use agate slabs to make lamp shades, wind chimes, coffee tables, and even fireplaces. Agates are hard (No. 7 on the Mohs scale) and during World War II they were used to make bearings for big guns.

The first commercial gem cutter in Miles City was Ralph Harris. He learned the trade in Seattle and planned to start his own business in Washington. While there, he happened to see some Montana agates; when he asked, he found they were from Miles City. Before he settled down in Washington, he took a trip to Miles City (in 1915), changed his plans, and immediately went into business there—a business which lasted for 43 years.

There were possibly two or three agate cutters in the Glendive area before World War I, but exact dates are a bit hazy in the minds of present-day Glendive residents.

One of those early agate cutters was John S. Larimer, who started with a shop in his basement and then expanded it into his barn. He was cutting agates before the United States entered World War I in 1917. The war made it impossible for companies manufacturing scales in the United States to obtain the bearings they previously obtained in Germany. The government asked Larimer to make these bearings, and he began to cut agates into small cubes—about 3/8- to 1/2-inch cubes—with a "V" in one side to hold the bearing rods for the scales. After the war, he returned to cutting agates for jewelry and operated a shop in downtown Glendive.

Larimer's son Bob, now living in Helena, recalls the 7 cents each he received for polishing and sanding stones his father had cut. He also recalls that he and other children took chips of agates, placed them in small glass jars of water to make them look shiny, and sold the jars for 10 or 15 cents to people traveling through on

trains.

Bob Larimer also recalls agate-hunting trips with his father. About 1919, his father built a 16-foot wooden boat and Bob accompanied his father and a friend on trips down the Yellowstone. The boat was shipped by train to Billings, and the little party would embark for the river with camping supplies and food for the long trip to Glendive. When they came to a town, they would find a lumberyard, buy lumber, build boxes, pack up the agates they had found, and ship them on to Glendive while they resumed their river journey.

Probably Miles City's best known agate cutter and jewelry maker was the late Ed Klapmeier. A valuable collection of his work was purchased by Curtis Meeds, owner of the Holiday Lodge at Glendive, and is permanently displayed in the lobby.

Klapmeier started his lapidary work at his ranch north of Miles City. He built a mud saw, and used a windmill to power it. The single disadvantage was that he could cut only when the wind blew. He built all of his machinery and made his own tools, using broomsticks for handles and converting nails into engraving tools. In winter, when blizzards kept him indoors, he developed his jewelry-making skills. In 1936, he moved into Miles City where he was employed at the post office. After retirement in 1961, he worked full-time at his hobby until his death in 1983, at the age of 86. Over the years, he generously shared his knowledge and skill with those interested.

There are other treasures besides agates to be found on the Yellowstone River. Petrified and agatized wood and brightly colored jaspers are abundant. Occasionally, a buffalo skull, a piece of fossilized bone, or an Indian artifact is also found.

No matter how many rock hounds hunt the river, they still seem to find sacks of rocks to carry home—plus the pleasant memory of a day in the open, among the birds, flowers, and wildlife. The day has been spent along a river not changed too much since William Clark hurried down it—past all those agates—on his way to rejoining Meriwether Lewis on the Missouri. ■

“Collectin Montan



phoebus parnassian (*Parnassius phoebus*) photo: STEVE WIRT

Like so many 8-year-old boys, I was first drawn to the study of natural history via the intervention of a butterfly.

The first *Vanessa cardui* (painted lady) I found in our backyard in Kalispell excited in me an undefinable, non-directional excitement which persists to this day: a marveling at the lengths to which nature will go in gratuitous embellishment of her creatures—ornamentation for no apparent (to me) purpose other than our own aesthetic enjoyment and mystification.

My ninth summer was spent gathering caterpillars and chrysalids from the soffits of old buildings around Bigfork and Swan Lake, then watching in wonder as they hatched into winged masterpieces. While the rest of the family was off fishing, I would roam the campground, net in hand, aching with longing after an admiral or a swallowtail careening at maddening height among the treetops. That summer I devoured Holland's "Butterfly Book," and put all the marvelously poetic (but now obsolete) scientific names to memory: *Vanessa antopia*, *Aglais j-album*, *Colias eriphyl*, *Papilio turnus*, *Pyramis cardui*.

A decade later, I found myself studying zoology at college, perhaps hoping to recapture through the study of living things some of that original wonderment. Yet, I found academic study fell far short of my hopes. I found myself sequestered in a dark corner of the library, poring over an organic chemistry text, memorizing the names of the entrails of a dead cat, immersing myself in the tedium of embryology sections. It was a far cry from my image of roaming the woods and fields, gazing in rapt awe at nature herself, watching the marvelously orchestrated motions of the whole clockworks rather than agonizing over each gear. Unable to concentrate, I got up and browsed aimless-



ly among the stacks in the natural history section of the library.

There I found it: "The Butterflies of Montana," by one Morton J. Elrod, published in 1906. An unpretentious little book that whisked me from the bleakness of winter quarter finals week back to the sunny pine woods of Swan Lake and to the wide-eyed wonder of childhood. As I read the words, it became clear that the book had been written by a kindred spirit, a naturalist after my own heart—a man who understood the wonder of nature, who knew how to convey to others the wonder he felt, who over half a century earlier had written lovingly of the same butterflies I

g Butterflies In a''

by Morton J. Elrod

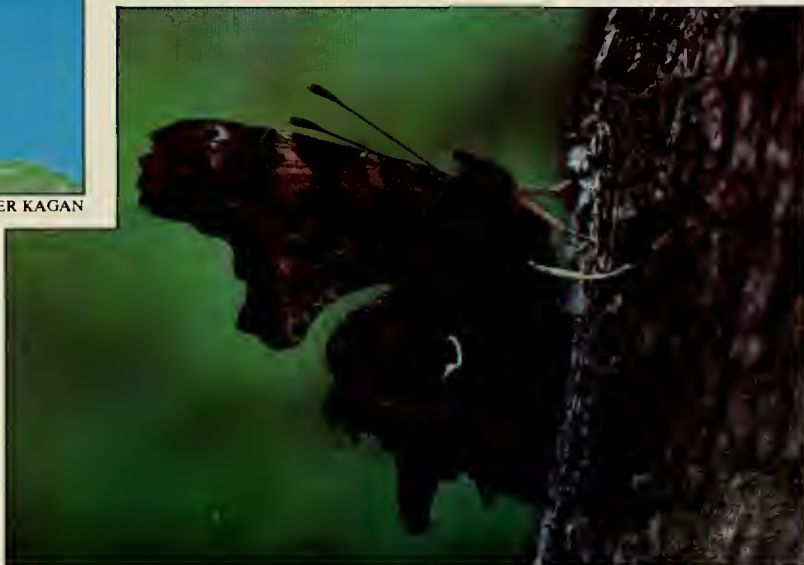
introduction by Larry S. Thompson



western meadow fritillary (*Boloria epithere*) photo: PETER KAGAN



western sulfur (*Colias philodice*) photo: GEORGE B. KIRSCH



satyr angle-wing (*Polygonia satyrus*) photo: GEORGE B. KIRSCH

had known and forgotten so long ago, of the same mountains and woods I had roamed as a child.

The Latin names brought back vivid images of magic places from long ago and far away: the lush meadows of Jewel Basin, the summit of Mount Aeneas, the shores of Flathead Lake, the dense larch woods of the Swan Valley. To my amazement, I found that Elrod shared this same pleasant association: Every butterfly in his collection, he wrote, "recalls some scene, whether it be the jagged skyline of the backbone of the continent as viewed from the Swan Range when we were sweeping in a few *Phyciodes* [crescents]... or the quiet and peaceful woods adjacent to the laboratory at Flathead Lake... *Vanessa j-album* [Compton's tortoise-shell] carries us to Swan Lake, where the maniacal call of the loon is answered by the bloodcurdling shriek of the puma, while the water lap-laps at the bottom of our boat as we head for the campfire on shore.

"Beautiful, dainty *Lycana melissa* [Melissa blue] carries us to Sinyaleamin Lake, cradled in the mountains, where we spent such happy and carefree days... . Whichever way we turn, whatever insect we pick up, our memory brings to us days of happiness and pleasure."

Elrod, I soon learned, was a true romantic, a nature-

poet in the best 19th-century tradition. He was also one of the most influential scientists ever to work in Montana. The following excerpts are from "Collecting Butterflies in Montana," a chapter in his book, "The Butterflies of Montana."

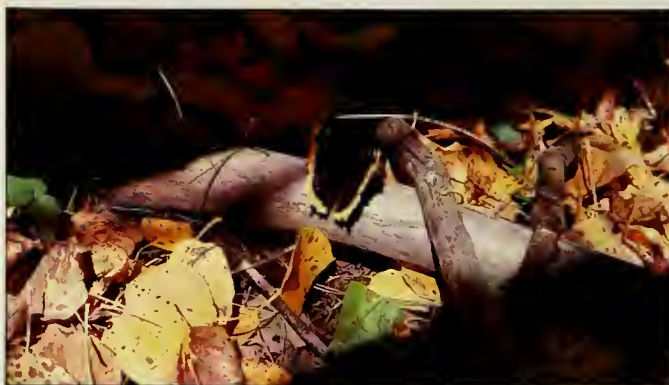
* * * * *

"July 22, 1903, was a hot day. For several days the sun had been warm. We were camped on the bank of Bigfork or Swan River at its outlet to Flathead Lake. Our little laboratory, constructed especially for outdoor work, had been a scene of activity within, but no one could stand it long in the swamps or woods on account of the mosquitoes. . . . A few hot days, followed by a wind, and it was predicted they would go. This had come. Donning my coat containing papers, vials, corks, gloves, and other necessary material, and accompanied by my dog, I started for butterflies. . . .

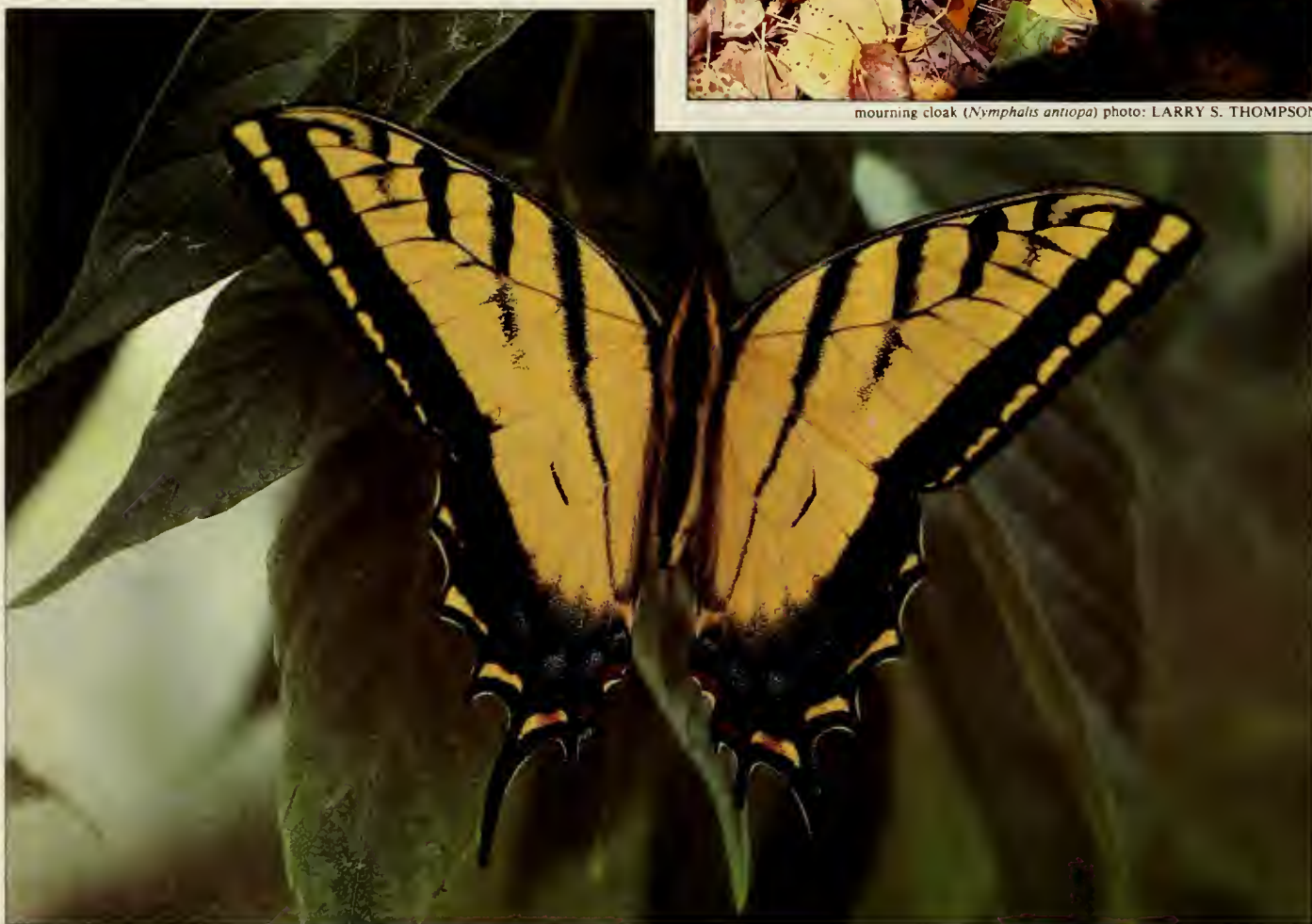
"The field sought was the tamarack forest. The beautiful and stately trees filled the slope of the lake near the laboratory. An occasional Douglas spruce or yellow pine added to the charm of the tamarack forest. A wagon road wound through the timber, affording a sunny opening in which the insects love to sport. On either side the tall conifers towered heavenward. A breeze was blowing. The murmur of the pines as they swayed gently at their tops



zephyrus angle-wing (*Polygonia zephyrus*) photo: LARRY DECH



mourning cloak (*Nymphalis antiopa*) photo: LARRY S. THOMPSON



western tiger swallowtail (*Papilio rutulus*) photo: LARRY S. THOMPSON

was music to the ear. The timber was not dense. The sun filtered through the leaves and between the treetops, making alternate patches of light and shade. In the forest, therefore, it was thought the airy creatures would sport, where the sun's rays were tempered by the shadow of trees, where the breeze would be less likely to blow against their delicate wings, and where they would be unmolested.



"The delicate bluebells nodded in the underbrush. Mariposa lilies were on the wane, but an occasional late one showed its delicate cream-colored perianth here and there. The twinflower was in bloom, making a carpet where other vegetation was lacking. Serviceberries were ripe, the blue-black berries hanging in clusters from every bush. Spiraea was gorgeous, just coming into full bloom. A fringe of rock maple, dogwood, spiraea, and serviceberry lined the road, while through the timber they were scattered in great profusion.

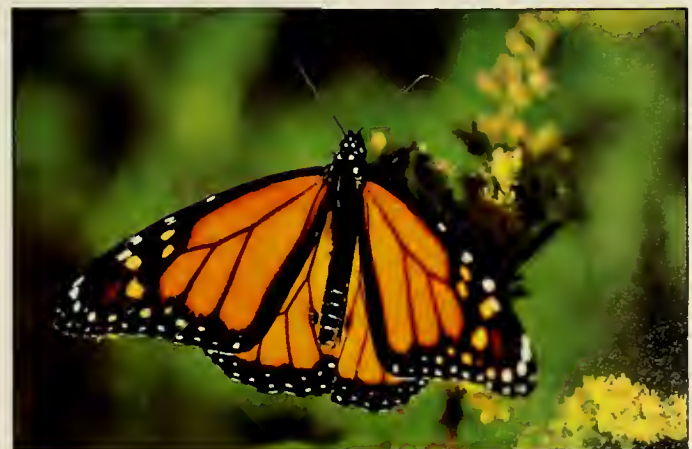
"It was a day for birds. The brilliant plumage of the Louisiana tanager flashed in the sunshine as he flew from tree to tree. The call of the western Phoebe was heard on every side. The long-tailed chickadee cheerily sang from the bushes by the roadside. Upon an old bole a flicker was calling to his mate, and alternately with his call drumming loudly on the dead tree. While sitting on a log and drinking in the sweetness of the bird music mingling with the sighing of the pines the loud call of the pileated woodpecker was heard in the distance; for this shy and handsome bird, the largest of our woodpeckers, is still not uncommon in the woods of Montana. I could not mention all the birds seen and heard. One hundred and forty species have been found in this vicinity. On that day the woods were alive with birds, sweet with their melody and with the odor of flowers. It was a walk of solitude, but I was by no means alone. . . .

"Scarcely had I left the laboratory when a beautiful *Eurymus* [sulfur] was seen flying over the bushes by the river bank at the entrance to the forest. Occasionally the delicate butterfly was seen, and I longed to have it. Carefully I followed until the time was favorable for a sweep, when it was safely landed, much to my delight. *Eurymus alexandra* [Alexandra sulfur] is not abundant here, but is often seen sailing gracefully over the tops of dense bushes, out of reach but aggravatingly near. It was a perfect specimen, the only one seen or taken during the day.

"I started before two. Along the road I went slowly, seeking the Argynnis [fritillaries]. They were out. Such beautiful and dainty creatures they are. Leto [Leto



siva hairstreak (*Mitoura siva*) photo: KRISTI DuBOIS



monarch (*Danaus plexippus*) photo: KEITH SZAFRANSKI

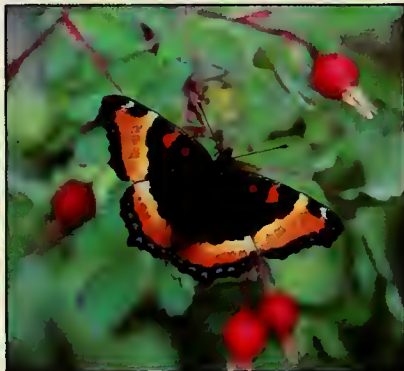
fritillary] was out in all its glory, but my captures were few. I simply could not do it. I was too awkward, slow, or something. They would not rest. Again and again their course would be near me and I would try, only to fail with an AH, and sigh of regret. Beautiful, dainty, delicate creatures, sporting in the open forest, flitting from open sunshine where the resplendent colors show in all their glory to the shadow of the forest where they may have a little respite. Their gaudy colors make them conspicuous a long distance off, and their large size makes it possible to detect them and distinguish them from others. Of the size of *Cybele* [great spangled fritillary] of the east, which was my early delight, it lends a charm to the forest superior in some respects to that given by music of birds or odor of flowers. Gorgeous in array, gentle in movements, short of life, its life history unknown, what wonder that it has charm....

"Shortly after four in the afternoon the trees were casting longer shadows, and already the cool of evening was being felt in the woods. The sun is the insects' god. When it shines all is life and activity. The whir of the beetle's wings is heard, and the bumblebee hums from flower to flower, flies and gnats fill the air, dragonflies and damselflies skim the surface of the water, and butterflies disport themselves on airy wing. But when a passing cloud obscures the sun, or evening approaches, every form of insect life, except the mosquito and gnats, seems to feel the depression, and goes to cover.... Two hours of brief collecting, and the work of the afternoon was over. The net result was... forty specimens, eight species.

"The above is typical of good days in western Montana.... The field is new, the unknown species lend zest to the search.... And the great state, with its wealth of life, beckons to the ambitious entomologist who may be the first in his locality, offering him a rich if not prolific field. To the collector will come a love for the woods and fields. They will not be places of solitude, for there he will find friends, and will commune with nature in that manner which brings the richest reward, when he is alone. He will feel the thrill of joy at first holding in his grasp a new find, for new they must be for years yet. His will be the pleasure, perhaps, of finding something new about some abundant species, for 'Unknown' is yet written after many species herein mentioned. Nay, perhaps his small collection may be the humble beginning of a larger work, leading to broad fields and to the fascination which comes to him whose horizon is broad, widening with each day's work, limited only by physical limitations. Love for the humble little creatures of the air, love for the beautiful in nature, as revealed in their rich ornamentations, love for nature itself, with a reaction upon the individual, making him more appreciative, more happy, and more contented, will be the final reward of the young collector.—M.J.E., Bigfork, Montana; July 23, 1903" ■



garita skipperling (*Oarisma garita*) photo: LARRY DECH



Milbert's tortoise-shell (*Nymphalis milberti*)
photo: GEORGE B. KIRSCH



zerene fritillary (*Speyeria zerene*) photo: MIKE ADERHOLD

Readers Respond

The Gullible Cutthroat With Three Flies

I found "Hooking Onto Special Regs" in the May/June issue of *Montana Outdoors* interesting, especially the incident about catching the westslope cutthroat twice on the same lure in a short time span. It reminded me of a similar incident with a Yellowstone cutthroat in Yellowstone Lake a few years ago.

I was shore fishing with flies on the east side of the lake and the cutthroat were hitting with some regularity. Presently, I hooked a fish which felt to be of fair size. After playing the fish for a short time, it broke off, taking my fly with it. I tied on another, and in about 10 minutes hooked another fish which, again after playing for awhile, broke off, causing me to lose another fly. This was vexing, as I tie my own flies and hate to lose them.

To correct the problem, I tied on a heavier tippet and resumed fishing. After landing and returning a few fish, I again hooked one which felt bigger. In due time, I landed a nice 18-inch cutthroat which—would you believe it—had three flies lined up in a neat row in the lower jaw—the fly I had just landed it on, and the two I had earlier lost. Remember: I tie my own, so identification of the flies was positive. I removed the collection of flies, returning them to my fly box and the gullible cutthroat to Yellowstone Lake with an admonition to be more careful in the future.—*Dal Burkhalter; Bozeman, Mont.*

The Bear Truth

I greatly enjoyed "Montana's Million-Dollar Black Bears" in your March/April issue. I agree with author Mike Aderhold's statement that there is a trend in wildlife administration to tie the degree of management of a species to the public's interest.

Here in Idaho, with considerable notice, black bears have evolved from predators to valued big game animals. This has been encouraged to no small extent by an organized segment of sportsmen that does not presently exist in Montana: the bear-hunting houndsmen.

We are now moving the management of black bears into yet another level, one to be appreciated especially by those who like sharing with our canine friends their enthusiasm for the hunt: non-consumptive hunting seasons. In some areas, this concept has allowed an extension of

seasons or preserved the opportunity to hunt bears where a reduction in the level of take is desired.

Hitchhiking along on the keen senses of our canine companions, we houndsmen have learned a lot about the habits of bears that is not available to men alone. One thing I must share with you is that there are a lot more bears than meet the eye. It should be no surprise that this intelligent, adaptable animal learns to stay hidden when he is under hunting pressure by powerful rifle-wielding adversaries.

I wish you well in your management of black bears. There are an infinite array of ways to enjoy this animal as yet undiscovered by Montanans.—*Richard R. Smith, president, Idaho Sporting Dogs Association; Salmon, Idaho*

Grizzly Eyesight, Antelope Hearing

Last summer while passing through Helena, I stopped at the Chamber of Commerce for information, and they gave me a *Montana Outdoors* magazine. I enjoyed it so much that I would like to subscribe. Now that I think about it, it would have to be a great magazine with all the wonderful people I've met in your fine state.

I would like to bring up a couple of points which may be of interest. I have been making movies (mostly 8mm) for about 20 years and have always heard that bears have poor eyesight; I have wondered about this.

Last summer, one of my stops was at Many Glacier Campground where I was trying to get pictures of grizzlies eating huckleberries. One day, I had just laid down my camera and case while I was putting up the tripod. I took out my glasses for a close-up view of this grizzly with a beautiful coat. Just as I raised my arms into the air with the glasses, he quit eating and turned his head about a quarter-turn, and looked straight at me. His eyes were plain to see. He was across the river and up the mountain, at least 700 feet away. He stared right at me for about 10 seconds, then turned and went on eating. IS THIS POOR EYESIGHT?

A different experience. Antelope have fine eyesight, but how about their hearing? As I approached a group of nine antelope about 700 or 800 feet away, I stopped to take some pictures before approaching closer. They were all grazing,

except one sentinel watching me. The motor on my camera is a quiet one, but the minute I pulled the trigger, all their heads went up instantly, and they just stared. This acute hearing really surprised me. People couldn't hear the camera motor 50 feet away.

Hope these points might be of interest to your readers.—*George Viliani*

A Thief is a Thief

From me, give your enforcement people a pat on the back for the sting operation, as reported in the May/June 1984 issue of *Montana Outdoors*.

I feel nothing but disgust when a bad apple appears in my chosen profession and hope the maximum sentence is imposed. A thief is a thief, whether he steals private property or public wildlife.

We work closely with our wildlife officers and have many times seen a casual, indifferent attitude displayed by violators.

I hunted Montana in 1983 and will be back this year, so impressed was I with the beauty of the state and the courtesy extended by your citizens.—*Trooper Billy E. King, Arkansas State Police; Mountain Home, Ark.*

Sting Operation Worthwhile

I enjoyed "Montana Sting" by Bill McKiernan. Most of what we hear about game wardens seems to involve some poor fellow getting pinched because he fell into an old habit and planned to tag his deer or elk when he got to his truck. Or some unlicensed father who held his son's rod while the son went to the car for a sandwich, or some other such triviality. Such things make one wonder whether we really need wardens.

Operations like "Montana Sting" are very worthwhile. There is no question about intent to commit a serious crime here. I would like to see Montana's enforcement resources directed more toward this kind of operation.—*John G. Tietz; Hamilton, Mont.*

Trips Relived

Please send three magazine binders; I've enclosed \$15. We love your magazine. Our trips to Montana are all relived through its pages. We have relatives in Plains.—*Mary Beth Nickolai; Princeton, Wis.*

SCRATCH, BARK... AND YOU GET A FLY

by Tom Ellerhoff
illustrated by Vern Craig

Kay has always had distinctive style. I suppose that's why it took the curious combination of beer, cigars, a crazed Russian blue cat, a lumbering great Pyrenees-Irish setter, and me to teach her the gentle art of fly-fishing.

Into every relationship come certain things you don't quite bargain for. For her, it was my "disgusting habit" of occasionally chewing tobacco and, to a lesser extent, heading to the streams and rivers of central Montana when warm summer evenings triggered age-old biologic clocks and aquatic insects boiled up from their stream bottom homes.

As for the chewing, there was no compromise; it remains a "disgusting habit." However, fly-fishing became part of my unchanging summer routine and, although she didn't particularly like spending evenings alone, the trips were ultimately met with indifference—an unalterable part of summer.

It's been difficult for Kay to become too detached from Montana's outdoors. As a youngster, bright Sunday mornings would find her and her father trolling for bull trout, cutthroat, and salmon in Flathead Lake, south of Kalispell, Mont. This was all to the consternation of a devout Lutheran mother who felt young girls should be in Sunday School.

From the time she left for college until her mid-20s, Kay managed to confine her fish experiences to restaurant menus. Fish and wildlife again came into her life when she was hired as an associate editor for a state outdoor magazine. Unfortunately, her journalism and liberal arts background included a lone course in biology and, as luck would have it, it met near the end of the day during spring quarter. Consequently, the class was often aban-

doned for the delights of campus high jinks.

For a person whose idea of an outdoors experience centered around a lounge chair on a sun deck, exposure to field biologists and researchers opened the door to a new and challenging world. Like a metamorphic cycle, mystical changes began to occur. The years of editing outdoors articles, scripts, and books started to take their toll, resulting in such startling remarks as: "You know those wormy marks on the backs of brook trout? They're called vermiculations!"

As this subtle education began to grow, so did her inquisitiveness about my summer fly-fishing rituals. Questions were posed so casually that they failed to pique my curiosity.

In addition to increasing her interest and knowledge through editing articles and reading other state outdoor magazines, she discovered many of her

professional friends were avid fly fishermen. Each year, these outdoor writers and editors from throughout North America meet to talk shop and garner new ideas. By coincidence, the summer meetings are often conducted near renowned trout streams, so naturally those who are interested come equipped to the tippet.

Acceptance as a professional woman in the male bastion of outdoor writing and editing is difficult enough, but to breach the inner circle of hard-core fly-fishing enthusiasts takes more than a love of beer. Although not totally responsible for her acceptance, Kay's love of a good—or, for that matter, a bad—cigar no doubt helped smooth the way.

Her returns from these national conclaves were often marked with thoughtful fly-fishing questions: "What weight line would my fly rod require?" "What are some of the knots you use when tying on a fly?" Or, "Is the tippet part of the leader?"

As Kay was slowly convincing herself fly-fishing might be fun, I was realizing that adding an enthusiastic beginner to my propensity for losing flies would result in spending the better part of our salaries putting some fly tier's kid through college. The answer was obvious: Learn to tie flies.

Learning to fly-fish was nothing compared with reducing the number of thumbs on my hands from 10 to two. A winter of discontent led to a spring of frustration, which drifted into a summer of kind of passable, and settled into a fall of not too bad. However, my "not too bads" were too late for the fast-fading fly-fishing season.

As my skills improved, innovation began to flourish. There were even some successes, such as the now famous "Fog Cutter."

In years of trying to marshal the skirmishes between our garrumphing half-Pyrenees Rocky and the kamikaze charges of our grey cat Fog, I finally discovered the only value they had in common: Both were bred for cold climates, and therefore both had double coats.

Generally, the only interest double-coated animals arouse is when the owners give them disparaging glances during the shedding season, which lasts approximately 1½ months. Not only do owners of such pets have to contend with the coarse outer hair, but they also must deal with masses of fluffy, soft fur tucked between the outer coat and skin.

More than a year of tying flies resulted in mastery of a few rudimentary patterns, most of them western fly imitations. One spring evening while studying Wulff patterns, I realized I didn't have the material to make the bodies for grey and blond Wulffs. As I sat there musing about what



might substitute, Rocky charged into the room as if the devil were close behind. Actually, that was close. With swept-back ears and arched tail, Fog followed at full tilt, swiping at the big fellow's haunches. The dog whirled behind the protective leg of my chair, while the cat stopped in mid-swipe, smugly assumed a sitting position, and began preening himself as if nothing had happened.

I put my hand down to calm Rocky and pulled back a small tuft of his silky undercoat. A close look revealed it was right for a blond Wulff. My eyes then turned to the cat whose preening had freed some of his grey undercoating. I picked up some of the grey fluff and rubbed it between my fingers. "Voila! Dubbing for my Wulffs," I thought.

After tying a half dozen blond and grey Wulffs, I inspected them closely and judged them superb. I could hardly wait for the spring thaw to finish thawing.

Finally, the streams dropped and cleared, and insect hatches came on. To test my creations, I chose a small, productive stream close to home. I confidently tied on a grey Wulff, made a few false casts, then sent it curling above where a good-sized trout had been sucking in insects. The fly floated down and landed gently. But instead of riding high, it settled, half submerged and slightly listing to one side. Not totally discouraged, I tied on a blond Wulff and flicked it upstream, but the result was the same. I was crushed. My dream of turning worthless dog and cat fur into a multimillion-dollar business was water-logged.

The next day, in an effort to break through my melancholy mood, I picked up a fly-tying book and began thumbing through it. I was skimming the section on nymphs, when something clicked that snapped me out of my gloom. On the one hand, the fur from these walking hairballs sinks like rocks, I thought, but on the other hand, nymphs are *supposed* to sink like rocks. Why not give it a try?

Using the cat's grey undercoating, I tied several muskrat nymphs. The finished products looked so good, I dubbed them "Fog Cutters."

An opportunity to try the new fly came the next weekend when some friends invited Kay and me to join them on a trip to a group of beaver ponds high in the headwaters of the Little Boulder River, just below the east slope of the Continental Divide. As we jostled and jolted along the eroded road to the brook trout ponds, the conversation turned to what flies we planned to use.

"I think I'll start with a woolly worm," the driver said. "How about you and Kay. What are you going to use?"

"Uh... I think we'll start with Fog Cutters," I replied, trying to sound nonchalant.

"What?"

"Fog Cutters."

"That's not one of those screwy patterns you tie using your dog's and cat's hair is it?"

"Well, yes it is," I confessed.

"You know, the only practical use you'll ever find for those dumb flies is as substitutes for lead weights."

"You're close," I replied.

Thankfully, the conversation shifted to



how Kay was progressing with her fly rod. I reported that even though she hadn't landed a fish, she had had some strikes and was becoming accurate with her casts. Not long after I finished, the bouncing ceased and the vehicle was nosed into a shady spot near the willow-infested ponds.

Since Kay's snake phobia is exceeded only by her new-found joy of fly-fishing, she encases herself in a secondhand pair of chest waders before setting foot out of the vehicle. She believes no self-respecting "no shoulders" would have a chance against the formidable rubber waders. That's the first reason she likes the

waders. The second is that they have a large bib-like pocket inside the top front, in which most people store excess fishing gear. Upon discovering the pocket, she said "Aha! My waders came with a beer holder!"

Feeling like a PT boat preceding a cruiser into battle, we set out—Kay with her "beer holder" filled and smoking a cigar "to keep away the mosquitoes," and the Fog Cutters, ready for baptism.

Although the water was down, the mud was up. After slogging through the mire for five minutes, I heard a voice behind me say determinedly, "I'm not liking this!"

A glance back revealed why. A billow of cigar smoke obscured the streams of perspiration flowing from the vicinity of

"I'm not at all sure I agree."

"We're almost there," I said, pushing through the last clump of willows and stepping into a large pool behind the main beaver dam. Just as I was beginning to survey the pond, there was a "slog-slog" sound behind me, a sweep of branches, followed by a forward lurch that nearly sent me head-first into the limpid blue water. My ace student had landed—fly rod, beer, cigar, perspiration, yellow visor, and all.

"This doesn't look very big," she commented, eying the flat plain of water through her almost black sunglasses. Suddenly a ripple from a rising brook trout caught her attention. "But then again, maybe this is big enough," she said in a hushed voice.



the yellow visor atop her head. Her "beer holder" was not performing satisfactorily, and rivulets of foam were running down the rubber waders, joining the putrid-smelling muck just above her knees.

"Chin up. It won't be long now," I replied, trying to sound reassuring.

More plodding along, and I heard her exclaim with even more determination: "I'm *really* not liking this!"

"Look, it wouldn't be any fun if you didn't have to work a little," I said.

As a few more fish dimpled the surface, her tone lowered to almost a whisper. "What are we going to use?"

"My Fog Cutter."

Her nose wrinkled. "Not that thing you were talking about on the way up? I thought you were kidding. Come on, let's use something that'll work."

"Look, I know my other patterns didn't work, but just give it a try. I have the fly box. If it doesn't work, you can put something else on."

I handed her a Fog Cutter and she

glumly tied it on to the tippet. Like a tugboat nosing a ship to its moorings, I slowly positioned her and her accoutrements so she could reach most parts of the pool without hanging up her backcasts.

A few vigorous puffs on the cigar sent clouds of bluish smoke circling around her yellow visor. "Mosquitoes," she hissed.

The anticipation was killing me.

"FISHING, remember? We're here to fish!"

"Okay, okay," she said, reaching into her "beer holder," pulling out the nearly empty can and taking one last gulp.

Gad, I thought, fly-fishing will never recover from this.

With all the preparatory rituals dispatched, she stripped several handfuls of line from her reel, made a few false casts, then tossed a long, arcing cast just to the left of the beaver dam.

To my utter joy, the Fog Cutter sank like a rock.

She slowly began retrieving the line, occasionally twitching the rod to give the fly some motion. The result—nothing.

She tried several more times, but with the same result.

She gave me a "this-is-not-working" look, and I countered with a hopeful "give-it-a-few-more-tries" look.

The line again unfurled across the pond, but soon after the fly sank, there was a definite tug on the line. "I got a strike," she whispered hoarsely, trying not to drop the cigar drooping from the side of her mouth.

The surge of enthusiasm was evident when the next cast landed near the same spot. As our eyes followed the course of the submerging fly, a rapt hush enveloped the small pond.

Suddenly the line straightened. There was no question—both fish and angler were solidly hooked.

"Now what?" she exclaimed, almost sending the cigar plummeting into her waders.

"Keep the tip up, and gently play it toward you," I yelled, trying not to sound too excited.

She expertly eased the fish over to my waiting net. The speckled, brightly colored 8-inch brookie wiggled as I lifted the net to show the newly initiated fly fisher her first catch.

She waded over, gingerly put her hand around the fish, unhooked it, gently placed it back into the water, slowly released her grip, and watched it as it went streaking back to its underwater home.

Looking down at the drenched grey fly, she fingered it, turned, and began working her way back to her "casting spot." She turned back and whispered, "Guess we'll have to brush the cat more often."

"Looks that way," I replied. ■



Flathead Lake (photo: DAVE BOOKS)

Flathead's Favorite Fish

by Janet Decker-Hess

He rose with the sun, gathered his fishing gear and lunch, and was out on Flathead Lake with the gull's first cry. There was still a slight chop on the water, but it was nothing compared with yesterday when the lake looked like an ocean. He was up from Salt Lake for two weeks in July, staying at his parent's cottage where his first lake trout still hangs on the wall and his old swimming suit lies at the back of a drawer.

Today he is after kokanee; the Alumacraft cuts across the water to the hot spot where he easily caught his limit two days ago, before the summer storm came through. His rod lies on the seat, the colors of the lead line like a rainbow on the reel, the

cowbells gleaming in the sunlight, and the orange fluorescent lure at the end of the line shiny and ready to go.

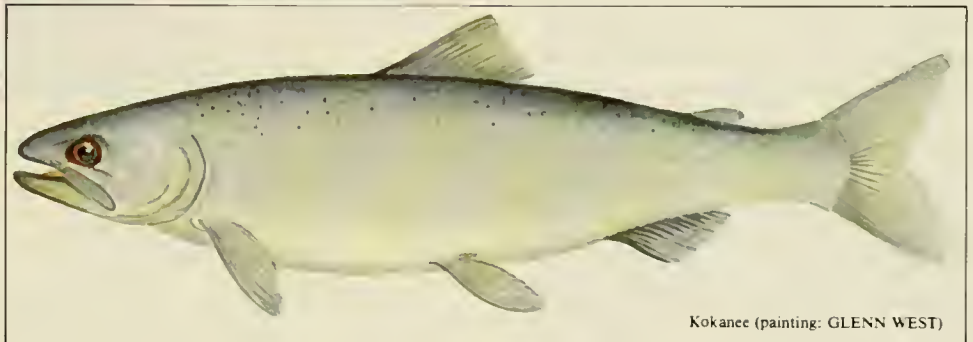
He's there, the first boat. He slows the motor to trolling speed, lets out three "colors" and waits for the first tug. Nothing. Half a dozen boats join him. Still nothing. He lets out another color. An hour passes. Maybe a little white corn on the hook will catch their attention. His neighbor arrives, a year-round resident with sonar equipment on his boat. He heads over to take a look at the neighbor's chart, but it shows only a few fish scattered here and there. He is perplexed when he remembers the chart of several days ago, with a solid block of kokanee at 30 feet.

Where did the fish go? Why did they leave? Why were they here two days ago, and why do only a few remain today? For that matter, why did he fail to catch as many as he did on

his last trip here five years ago, even though they are a lot bigger now? Why was he allowed to catch 35 per day then and only 10 per day now?

The Early Years

These questions and others have perplexed biologists since kokanee salmon were introduced into Flathead Lake. Located in northwestern Montana, Flathead is the largest natural freshwater lake—127,000 acres—in the western United States. The lake is about 28 miles long, four to 14 miles wide, with a maximum depth of 386 feet. Although it is a natural lake, Kerr Dam was constructed at its outlet in 1938. The dam causes fluctuations in the upper 10 feet of the lake, and stores spring runoff water for flood control and winter energy needs.



Kokanee (painting: GLENN WEST)

Over the years, 15 non-native fish species have been introduced. So came the kokanee to the Flathead; it was initially reported in 1919, although no official records document its introduction. Kokanee were probably accidentally planted with some chinook salmon in 1916 in two smaller lakes in the Flathead drainage. A few years later, kokanee were spawning along Flathead Lake's shoreline. A sport fishery began in 1933, when kokanee were harvested during the summer. They were officially stocked in the lake in 1935 and planted through the 1950s.

The 1940s

In the 1940s, interest in kokanee took a back seat to a greater concern over their home. The Bonneville Power Administration (BPA) and the U.S. Army Corps of Engineers wanted more downstream water. They proposed raising Flathead Lake

an additional 17 feet by 1945, while considering an ultimate “goal” of raising the lake 37 feet. This would have put Kalispell’s main street on the shore of Flathead Lake. A hearing was conducted in Kalispell that brought considerable protest from the valley’s residents. A letter from Sen. Mike Mansfield to President Franklin D. Roosevelt—which Mansfield called “the most important letter I have ever written in my life”—stated the concerns simply: “The Flathead has sent 3,000 and 4,000 of its sons and daughters into the armed forces...to protect their homes and country. I sincerely hope that when they return they will not find they have won the war abroad only to find they have lost their valley....” The BPA and Corps retreated from these plans. But in 1948, the Bureau of Reclamation began construction of Hungry Horse Dam on the South Fork of the Flathead River above the lake to meet this demand for upper basin storage.

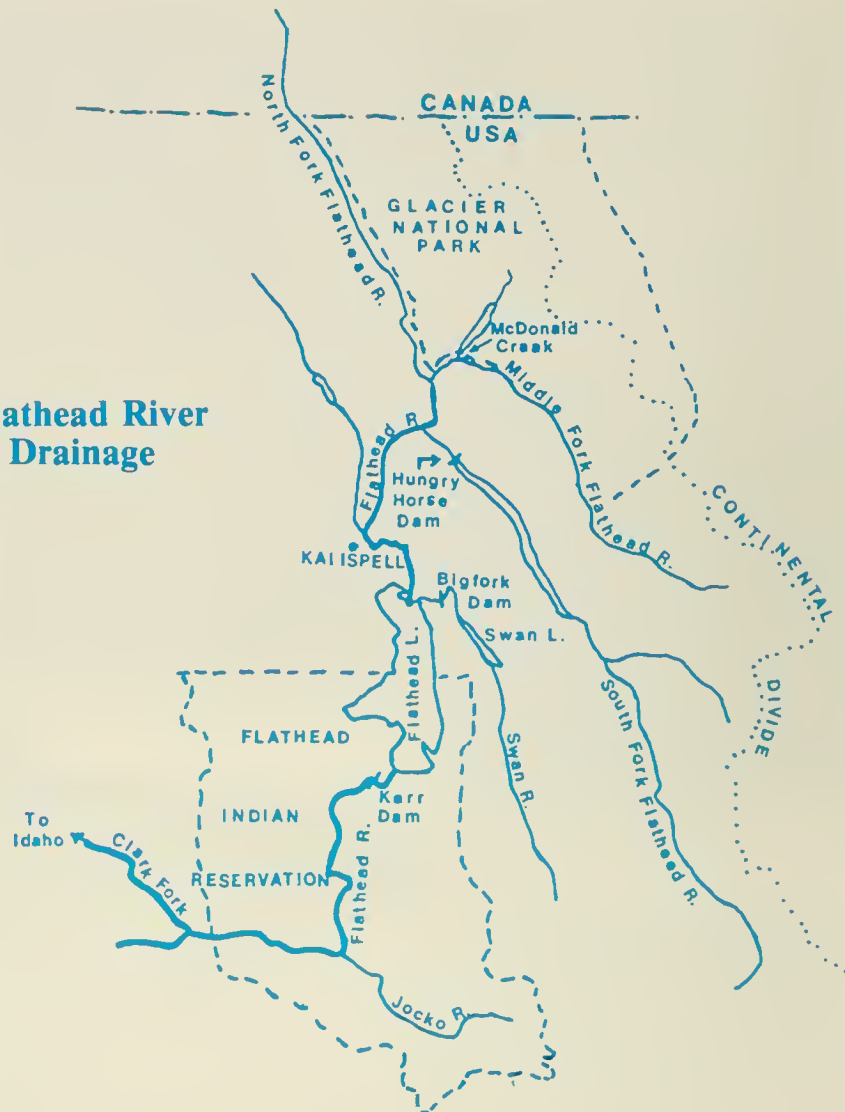
Although the fishery for kokanee had been established in Flathead Lake since the early '30s, not much was known about this increasingly popular fish. During the summer, they were caught in the open waters of the lake. In the fall spawning season—when their appearance changed from a silvery “blueback” to a humpbacked, hookjawed “red fish”—the larger, adult fish were found only in shoreline areas.

By the late 1940s, fishermen began to notice that the kokanee were becoming smaller and smaller each year. The crew from the Somers State Hatchery, on the lake’s west shore, and staff from the University of Montana Yellow Bay Biological Station began investigating. Sampling done during the spawning season found more males than females, females smaller than males, and the size of adults had diminished from 16.1 inches in 1938, to 14.1 inches by 1949.

The 1950s

In 1949, Frank Stefanich became the first Department of Fish, Wildlife and Parks biologist to work out of the Kalispell regional office, and he continued investigating the ecology of what was becoming Flathead’s favorite fish. Research conducted in

Flathead River Drainage



the early '50s revealed 30 shoreline areas where kokanee spawned in the lake, and additional areas in McDonald Creek in Glacier National Park, in the South Fork of the Flathead River below Hungry Horse Dam, and in the Whitefish and Swan rivers. Size had continued to decline during this decade, to 11.6 inches by 1957.

John Cox, Somers Fish Hatchery manager, thought he had a solution to the problem of kokanee size. He suggested planting kokanee eggs from Lake Mary Ronan into Flathead Lake because the fish in Lake Mary Ronan were much bigger than those in Flathead. It was a novel approach, but it did not solve the problem.

In 1959, Boyd Opheim replaced Stefanich as fisheries manager. He continued to puzzle over the question of what was causing the decrease in

size. About this time, fisheries workers in Canada determined that the more kokanee there were in a body of water, the smaller they would be; the fewer the fish, the larger. (The term used to describe a population whose size is determined by its numbers is “density dependent.”) When kokanee were first introduced into Flathead Lake, their densities obviously were low and there was plenty of food and habitat to go around. As new and successful spawning grounds were established, the population increased; the limited food and habitat in the lake produced more fish—but they were smaller.

The 1960s

Otis Robbins, an information officer for the department in Kalispell, conducted the first Flathead Lake creel census in 1962. His study

Department fisheries biologists are studying many aspects of Flathead Lake's kokanee populations, including their food habits.



Another phase of fisheries research includes counting and "sizing" Flathead Lake's kokanee.

underscored the kokanee's importance to the fishing public: Robbins estimated 120,000 days of fishing pressure on Flathead Lake—with about 75% of the catch kokanee.

A 1961 letter from Opheim to William Alvord, then chief of fisheries for the department, pointed out that fishing success had declined because of an extremely warm summer. No changes in management occurred the following summer, but because the weather was cool, fishing success was again high.

In the early 1960s, fisheries biologist Laney Hanzel began intensive research on kokanee and their habitat. With the increased sophistication of instruments available, Hanzel began developing techniques—using hydroacoustical instruments (echo sounders), purse seines, plankton nets, devices for recording water temperature, and photometers—to learn about kokanee habitat. Much of this work throughout the next two decades was accomplished with the aid of the 35-foot *Dolly Varden*, an Alaskan commercial fishing boat turned research vessel, and Bud Mead, the *Dolly's* operator. Their work and that of other biologists determined that

light penetration, plankton concentrations, and water temperature were the three most important factors affecting kokanee distribution.

Hanzel's results concurred with those of other biologists: Kokanee are pretty particular when it comes to where they live. They also have a very narrow tolerance to changes in water temperature. The optimum temperature range is from 42° to 55°F. Adult fish can survive at higher temperatures, but juvenile fish will die in water warmer than 60°F. Depending on the season, the depth at which this ideal temperature will be found varies. Because of the immensity of the Flathead and its unstable climate, the quality and quantity of kokanee habitat can shift daily, weekly, and seasonally.

From November through May, the lake is "isothermal" (same temperature from top to bottom). Beginning in June and continuing into October, the lake becomes "stratified" into layers of water defined by temperature. The upper layer is warmed circulating water which lies over a deep, cool, and undisturbed region. Between these layers is a narrow layer of water where the greatest change in water temperature occurs. This layer,

called the "thermocline," is usually about 10 feet thick, and lies at a depth of 30 to 45 feet.

Hanzel and fisheries biologists working elsewhere found that because of the narrow range of temperatures they tolerate, kokanee spend their summers just below the thermocline. Depending on summer air temperature and storm action, this layer could be very thin and near the surface, or thick and located at greater depth. Because Flathead is usually only weakly stratified, it doesn't take much of a storm to scramble these defined layers—along with the narrow band of "kokanee water." Once mixing occurs to create a thicker layer of water with an adequate temperature, kokanee disperse and become harder to find and catch—the problem faced by the fisherman at the beginning of this article.

Adult kokanee in the lake reached their smallest average size (10.6 inches) in the late 1960s. This large number of kokanee, indicated by their small size, was probably because of increased spawning success related to the early operation of Hungry Horse Dam. Bottom draw releases of warmer water from the reservoir created conditions conducive to successful kokanee egg incubation in the mainstem Flathead below the South Fork.

The 1970s

Throughout the 1970s, Hanzel continued to investigate the kokanee population in the Flathead. He developed a technique to estimate the number of kokanee longer than 10 inches living in the lake. The technique uses fish counts made with sophisticated sonar equipment along with established transects crisscrossing the lake. Biologists verify the species composition by catches from gill nets or other techniques.

In 1975, Hanzel was joined by biologist Scott Rumsey. That fall, Hanzel documented the large numbers of adult kokanee using the river system to spawn. Through a creel census on the snagging fishery, he estimated 17,688 days of fishing on the upper river during the spawning period, with a harvest of 131,793 kokanee.

By this time, many fishermen had

acquired sonar equipment and were able to find that "band" of fish in the lake. In the mid-1970s, kokanee averaged 12 to 12.5 inches, the size most desired by Flathead fishermen. With a limit of 35 daily, and a possession limit of 70, everyone was happy.

Adult kokanee length had increased throughout the 1970s, except for three years in the early part of the decade. By the late 1970s, spawners averaged 13.5 inches, an increase of three inches in less than 10 years.

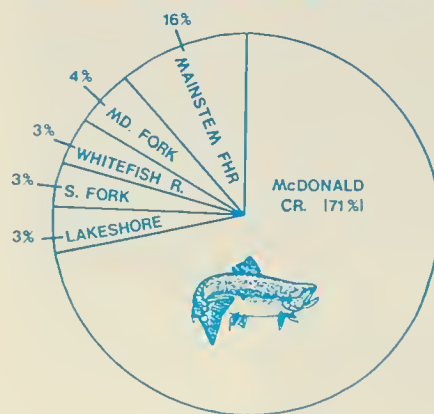
The 1980s, and the Future

Densities of Flathead kokanee were dropping, and biologists became concerned over the steadiness of the decline.

Since spawning success is considered the most important factor governing strength of each year's fish, biologists once again turned their attention to spawning areas. Kokanee were using McDonald Creek, the mainstem Flathead, shoreline areas of the lake, the Swan and Whitefish rivers, and the Middle Fork of the Flathead. As Patrick Graham noted in a July/August 1982 article in *Montana Outdoors*, the decline of kokanee was attributed in part to winter dewatering of spawning sites in the mainstem Flathead below Hungry Horse Dam. Research begun in 1979 by fisheries biologists Steve McMullin and John Fraley determined that in large rivers like the Flathead, kokanee spawn primarily along stream margins and in side channels. Dam operations causing water level fluctuations of over six feet in the South Fork and up to four feet in the mainstem resulted in alternate wetting and dewatering of eggs during the spawning season. Dewatering quickly kills eggs incubating in stream gravels because they are exposed to the cold and they freeze. However, by voluntarily controlling flows from the dam, the Bureau of Reclamation and BPA are now providing more favorable conditions for egg incubation in the river.

The number of kokanee using Flathead Lake shoreline spawning areas has also declined. The lake is drawn down by operation of Kerr Dam for hydroelectric generation and flood control beginning in October and continuing throughout the winter until spring runoff. Since kokanee

Relative Contribution of Flathead Kokanee Spawning Areas, 1981-83



begin spawning about the same time the lake begins to be drawn down, the dam's operation may be impacting kokanee reproduction. Studies conducted on other northwestern lakes indicate that kokanee spawn in shallow areas where there is moving water from a tributary or an underground spring.

Until the late 1960s and early '70s, the shoreline snagging fishery was described by fishermen as "shoulder to shoulder with 40 other people," "everyone catching his limit," "the lake red with salmon" or "hundreds of dead fish washed up on the banks." Very few kokanee use the shoreline areas today. A study begun in 1981 and funded by the BPA has found only 10 bays currently used, with an average of only 750 redds (egg nests) constructed annually. This is insignificant when compared with the 30,000 to 100,000 spawning kokanee annually using McDonald Creek. The study has determined about half of the redds constructed annually in shoreline areas were exposed during lake drawdown. The others were located at depths to 60 feet, where spawning habitat can be marginal.

The effect of drawdown exposure on survival of salmon embryos in shoreline areas has also been determined. As length of exposure increases, survival of eggs decreases. Before they hatch, eggs moistened only by damp gravel and sand in the upper shoreline can withstand extended periods of exposure. Once the eggs hatch, mortality occurs within 48 hours if the fry are not in moving

water. Mortality occurs much quicker if freezing air temperatures exist. After an extensive analysis of Kerr Dam operations, it was found that changes in operation beginning in the 1970s could cause such exposure.

As the average size of kokanee continued to increase to nearly 15 inches in 1983, fisheries biologists continued study of Flathead's favorite fish. Based on a 1982 creel census conducted on the lake—which estimated 168,000 days of fishing pressure and 92% of the catch kokanee—researchers know the kokanee is very important to Flathead fishermen. Monitoring of spawning areas continues. If favorable flows continue out of Hungry Horse Dam, biologist Fraley has estimated the kokanee spawning population in the river could recover to 1975 levels by the late 1990s. Management alternatives to enhance kokanee shoreline spawning must be balanced with energy production losses. Both dam operational changes and reintroduction of hatchery kokanee into historical spawning areas are among the mitigation alternatives under consideration by the project's staff. Biologists are also examining other factors that may impact shoreline spawning, such as increased shoreline development and declines in flows of underground springs. The importance of maintaining a variety of spawning areas lies in the vital biological concept of diversity. The greater the variety of spawning habitats, the greater the chance kokanee have of surviving natural or man-induced catastrophes.

Other kokanee recovery efforts involve changes in fishing regulations. Region 1 (Kalispell) Fisheries Manager Jim Vashro hopes to increase the numbers by temporarily closing the snagging season throughout the Flathead system and reducing the daily and possession limit in the lake to 10 fish. He has also increased limits of kokanee on other regional lakes to spread out the fishing pressure.

Latest research efforts to learn more about the kokanee involve department biologists capturing and tagging large numbers of fish which concentrate in the southern half of the lake during the winter. Beginning in January and continuing into March or April, huge schools of

continued on page 37

Contributors

• When times got tough during the energy crunch of the 1970s, we once again began looking toward the “old reliables”: sun, wind, and water. Solar panels sprouted from rooftops and passive solar homes became popular. Wind-powered generators and wind farms proliferated. Water’s part was small-scale hydropower generation—projects designed for mountain streams. As **Al Elser** writes: “Small-scale hydropower projects, unlike solar and wind power, are often associated with significant environmental impacts.” Turn to “Small Hydro: Old Idea, New Problems” on page 8. Formerly the fisheries manager for Region 7 (Miles City) and Region 5 (Billings), Elser is now chief of the Fisheries Division Management Bureau, Helena.

Elser’s article is illustrated by **Harvey Eckert**, Butte. Eckert’s meticulous attention to detail and color result in pieces remarkably accurate and true to form. He is now working as a full-time free-lance artist and his art has appeared in many fly-fishing publications. The illustration in this issue of *Montana Outdoors*, “The Drift,” is available as a limited edition, numbered, and signed print. His work is available through Nature’s Shadow Studio, 2800 Gladstone; Butte, MT 59701.

• Montana agates share the title of state gem with the sapphire. And the state’s agates are much desired by rock hounds all over the world. Some people claim agate hunting as a hobby, while others go into business and open rock shops to sell both jewelry and uncut material. Why are these people willing to walk up creeks, around hills, or down rivers carrying sacks of heavy rocks? Because the rocks are agates, and they are “The Rocks with the Pretty Pictures” inside. From yellow and orange to brown or almost black, the pictures of trees, lakes, hills, flowers, and animals emerge when the stones are properly cut. For a look at a fascinating hobby, and some of the history surrounding agate hunting in the Yellowstone River country, turn to **Pat Gudmundson**’s article on page 15. Gudmundson, a lifelong Montana resident, has been a rock hound for 40 years. She was a reporter for 25 years with the Miles City Star, and has now retired to part-time reporting.

• **Larry S. Thompson** and **Morton J. Elrod** are kindred spirits. They became acquainted through “Collecting Butterflies in Montana,” a chapter in Elrod’s book, “The Butterflies of Montana.” Although the unpretentious little book had been published more than half a century before Thompson came upon it in the natural

history section of his college’s library, it took him away from a bleak winter quarter finals week back to a time when “natural history” meant “butterflies.” Thompson writes: “As I read the words, it became clear that the book had been written by...a naturalist after my own heart—a man who understood the wonder of nature, who knew how to convey to others the wonder he felt, who...had written lovingly of the same butterflies I had known and forgotten so long ago, of the same mountains and woods I had roamed as a child.” Turn to the beautifully illustrated article on page 18. Elrod was professor of biology at the University of Montana and director of UM’s Biological Station. Thompson is biological sciences coordinator for the Department of Natural Resources and Conservation. He is completing a book on early natural history explorations in Montana which will be published by the Montana Geographic Series, and his writing has appeared in *Audubon*.

• **Tom Ellerhoff**’s fly-fishing career began in his native state of Iowa. He managed to continue his piscine interest during Army days in Texas. When he moved to Montana in 1970, his dreams of fly-fishing heaven were met. Until...he acquired (not necessarily in the following order) a dog, a cat, and a wife who evolved into an enthusiastic—if not traditional—fly fisher. He soon realized that adding a beginner to his own propensity for losing flies would result in putting some fly tier’s kid through college. The solution was obvious: He learned to tie his own flies—but using some less than usual materials. There’s a clue in the title of his article: “Scratch, Bark... And You Get a Fly.” It begins on page 24, with illustrations by **Vern Craig**. Ellerhoff works for the Environmental Sciences Division of the Department of Health and Environmental Sciences. Craig was assistant administrator of the Department of Fish, Wildlife and Parks Conservation Education Division; although “retired,” he continues his involvement with and contribution to many department projects.

• A 1962 creel census on Flathead Lake revealed 120,000 days of fishing pressure, with about 75% of the catch kokanee. A 1982 creel census estimated 168,000 days of fishing pressure—with 92% of the catch kokanee. It’s clear that the kokanee is the “Flathead’s Favorite Fish.” But with the title have come some problems, which **Janet Decker-Hess** explores in her article, beginning on page 27. Decker-Hess is project biologist on a Bonneville Power Administration-funded study of

kokanee shoreline spawning in Flathead Lake and the impacts of fluctuating water levels. She expresses her appreciation to the “dedicated work of many biologists who worked on the project before me, without whom the article could not have been written.” She is president of the Montana Chapter of the American Fisheries Society.

• If you ask folks about fishing in Fort Peck Reservoir, a few would probably say, “It’s good.” Some would say “pretty fair,” and lots would say “poor.” That’s what **Jim Liebelt** examines in his article, “The Ups and Downs of Fort Peck Reservoir” (page 32). He looks at the fluctuating northern pike fishery; coho and chinook salmon and smallmouth bass plants; the emergence of the walleye as a sport fish in the reservoir; the importance of finding a forage fish as a food base for walleye, northern, and other large predator species. An accompanying sidebar traces the history of Walleyes Unlimited of Montana, a group working hard to further the cause of warm-water fishing in Fort Peck Reservoir and elsewhere. Liebelt is the department’s information officer for the Glasgow region; before that, he was a department fisheries biologist in the Fort Peck area for over 10 years.

• The spring and summer issues of *MO* traditionally lean toward articles about fish. There could be no more appropriate artist for the covers than Helena’s **Shirley Cleary**. This magazine’s wrap-around cover depicts “Fishing the Little Blackfoot.” The original has been selected by the Washington State Arts Commission for purchase through their Art in Public Places Program. Her work has appeared previously in *MO*, in *American Artist Magazine*, *Art West*, *American Artist Diary* for 1983, and *Contemporary Western Artists*. She is an avid fly fisher and is active in the Missouri River Chapter of Trout Unlimited. She recently won “Best of Show” at the El Dorado Gallery’s Third Annual Miniature Show. Her work can be seen at several galleries, including the Tatem House in Helena.

• Special thanks to **Steve Kohler** of the Forestry Division, Department of State Lands, for his help in identifying the butterflies pictured in this issue. And thanks to the following photographers for their contributions: **Mike Aderhold**, Kalispell; **Larry Dech**, Grand Haven, Mich.; **Kristi DuBois**, Choteau; **Peter Kagan**, Heron; **George B. Kirsch**, Anaconda; **Keith Szafranski**, Livingston; and **Steve Wirt**, Whitefish.—*Kay Ellerhoff*

The Ups And Downs Of Fort Peck Reservoir

by Jim Liebelt

Fishing in Fort Peck Reservoir: A few say it's good; some say it's pretty fair; lots of people say it's poor. Looking back over the years, there's no doubt this reservoir, Montana's largest single body of water, has had its ups and downs from a fisheries standpoint.

Construction of Fort Peck Dam began in the early 1930s and was essentially completed by 1937. Originally constructed for navigation, flood control, power, and irrigation, recreation was not considered when this project was conceived during the Depression years.

Once the almost four-mile-long, earth-filled dam was completed, waters of the Missouri River began forming what eventually was to become a reservoir over 130 miles long.

maximum depth is 220 feet and it covers 245,000 surface acres at full pool. It contains roughly 19 million acre-feet of water (an acre-foot of water is the amount needed to cover one acre with water one foot deep) and has an astounding shoreline length of about 1,520 miles. The reservoir generally covers a narrow area along the old Missouri River channel, with the exception of the Big Dry Arm, which extends for about 40 miles on the southeast side of the reservoir up what was originally Big Dry Creek. This unique combination of land and water that now comprises Fort Peck Reservoir provides home for over 50 fish species, 16 introduced, the rest native.

Fish management in eastern Montana was still in its infancy in the early

The Missouri River, the only water flowing through the reservoir, also contributed its share of water. In 1941, 10 years after the dam's completion, the power plant began operating. A second power plant began operating in 1945. The possibility of a third power plant exists, but the controversy over environmental concerns has it as a distant future.

It's hard to believe that within a few years of water, so much controversy has been and is being generated. A few species of game fish have thrived, some have not. The controversy

over Fort Peck was intense. Looking over early fish-planting records for the Department of Fish, Wildlife and Parks, it is evident that at one time people were asking fish species would provide for best long-term fishing of the reservoir, or if fish would be an important forage item.

The first recorded fish plant in Fort Peck was in 1938, when an unknown number of white perch were released. During the 1940s, more yellow perch were planted, along with largemouth bass, bluegill, bullhead, largemouth bass, and others.



kokanee (salmon), rainbow trout, and brown trout.

In the 1950s, planting of rainbow trout and kokanee continued, while lake trout, walleye, and northern pike were introduced for the first time. From 1953 to 1957, over 400,000 lake trout were planted. Walleye were planted only during 1951, when approximately 578,000 fry were released into Fort Peck. Northern pike were also introduced only during 1951, with plants of about 550,000 fry and 1,200 10-inch fish. These plants provided the basis for what was to become some of the most exceptional sport fishing anywhere.

Little is known about how good the sport fishing was during the reservoir's early years. Scattered reports and conversations with old-timers indicate perch and sauger fishing was good, and a fair number of trout were caught as well. Other species, such as crappie, channel catfish, freshwater drum, and goldeye were also prevalent in the catches. Some northern pike and probably walleye began to show up in the mid-to late '50s, but few kokanee, largemouth bass, or bluegill were ever caught. One can also appreciate the fact that fishing pressure—considering the immense size of the reservoir—was light. Access to many parts of the reservoir was difficult at best, and there were relatively few people in the area.

— Northern Pike Hot Spot —

When the 1960s arrived, a number of interesting things happened at Fort Peck Reservoir. Perhaps most significant was nationwide recognition as a hot spot for northern pike, many in the lunker category. Leading outdoor magazines touted the fabulous pike fishing, and the popularity of the reservoir increased tremendously in a short time.

The circumstances leading to this boom are worth looking at, since they help explain the inherent difficulty of fisheries management in large reservoirs. The earlier plantings of northern pike were the foundation of the fishery, since obviously enough had survived and reproduced to establish a base population. However, the impetus for the boom really began in 1955 when Fort Peck was drawn

down over 40 feet because of the filling of Garrison Reservoir (or Lake Sakakawea) in North Dakota. This event was important because it allowed large areas of terrestrial shoreline vegetation to develop around the reservoir.

During the next five years, Fort Peck experienced successive rises which flooded portions of the vegetation in time for successful northern pike spawning. (Northerns depend on vegetation to successfully reproduce.) This sequence of events was again repeated between 1962 and 1965, when the reservoir rose over 50 feet in successive stages. The northerns produced during these years helped to continue the exceptional fishing into the late '60s when it began to taper off.

After 1965, water levels in Fort Peck peaked in early summer, and gradually decreased until the next spring, when snow melt and runoff again raised the water level. Unfortunately, in most years, the spring rise was neither soon enough nor extensive enough to accommodate early spring spawners such as northern pike; therefore, only limited, or in some years no, spawning occurred. Without major changes in present water level patterns to allow growth of shoreline vegetation, reproduction of northern pike and other species will continue to suffer. Currently, the type of water level manipulation needed to produce the desired changes are infeasible and we must rely on Mother Nature to provide the "right conditions."

With the decline of the northern fishery, a new species, the coho salmon, was introduced. A member of the Pacific salmon family, this species had been planted in the Great Lakes and was providing exceptional fishing. The first plant consisted of about 140,000 fish and was divided between the Missouri and Marias rivers above the reservoir, and the Big Dry Arm. Additional introductions were made between 1970 and 1973, with over 400,000 fish released into the reservoir. No catches of coho from either the Missouri or Marias were confirmed, but a fair sport fishery developed within the reservoir and continued through the mid-'70s. Further plants were prevented because of a state law prohibiting im-

portation of salmonids, including eggs, unless they had been certified free of certain diseases.

The department continued to plant northern pike during the 1970s to try to maintain a fishery as well as to ensure an adult population should favorable spawning conditions recur. Northerns were planted each year (except 1978), with a total of about 641,000 fish released.

— The Walleye Emerges —

It was also during the '70s that a "new" sport fish, mostly unknown before, emerged from the depths of Fort Peck to gain almost complete dominance of the sport fishery. The meteoric rise of this species—the walleye—was nothing short of a phenomenon.

The fact of a substantial walleye population in the Big Dry Arm of Fort Peck really did not surface until spring of 1974 when department fisheries personnel trapped impressive numbers of walleye. It didn't take long for word to spread, and soon the rush was on. The Big Dry Arm received heavy fishing pressure (at least by eastern Montana standards) during the next few years, and thousands of walleye were reduced to filets by happy fishermen. But, as with most good things, it was over all too soon. The walleye catch dropped off rapidly by 1978, both in numbers and size of fish, and it wasn't long before the fishing fraternity began discontented rumblings.

Natural reproduction was not keeping up with the demand for filets. In 1976, biologists began studying the reproductive success of various spring-spawning fishes. Walleyes successfully reproduced in the Big Dry Arm only in years when flows in Big Dry Creek were sufficient to allow fish to pass from the reservoir into the stream; they would spawn in the stream during April and early May. These conditions didn't (and don't) occur very often, and they resulted in entire years with little walleye reproduction—which eventually led to poor fishing.

With a plant of about 63,000 in 1977, the department once again began to stock walleye. During the next two years, over 830,000 were released, mostly into the Big Dry

Arm. However, there were problems besides the apparent scarcity of walleye. The average walleye size had decreased, and biologists found declines in yellow perch and emerald shiner populations, food sources on which the predator walleye heavily depends.

In waters where they co-exist, yellow perch are the natural prey for walleye, and they were probably the

most important food source in Fort Peck. The reason for decline of the perch population was probably related to silt deposition within the reservoir. Yellow perch spawn over brushy material, where their ribbons of eggs remain suspended from the bottom until hatching. Much of the woody vegetation flooded with the filling of the reservoir has rotted or become covered with silt, gradually

eliminating perch spawning habitat.

Populations of emerald shiners fluctuate drastically, sometimes on a yearly basis, throughout their range. However, in Fort Peck, the shiner population experienced a marked decline in the late 1970s; while some recovery has occurred, their numbers remain relatively low. Biologists don't understand why, but it may be related to the problem of siltation or

Walleyes Unlimited of Montana

Something important grew out of the poor walleye fishing in Fort Peck Reservoir and the controversy over smelt. These dissatisfactions resulted in a new sportsmen's group, one that began in the mind of Greg Pauley, former owner and operator of a gas station and tackle and bait shop in the town of Fort Peck. Pauley and a few local fishermen were frustrated by the poor walleye fishing and the seemingly slow response of the Department of Fish, Wildlife and Parks to improve it, and decided to try and do something about it: They formed Walleyes Unlimited of Montana (WUM). Within months, local chapters were formed throughout eastern and central Montana, with a total membership of nearly 4,000—and still growing (Pauley is now the executive secretary for WUM). The major goals of the group are to: (1) promote walleye and warm-water fishing in eastern Montana; (2) develop a forage fish program in Fort Peck and other waters; and (3) develop a suitable warm-water hatchery that will answer the needs of warm-water fishing.

The group's influence soon was felt. The department gave notice of a strong commitment to improving forage fish conditions and sport fishing in Fort Peck Reservoir and other waters in the state. The 1983 Montana Legislature appropriated special funds to: (1) hire an engineering consulting firm to determine if the old Miles City Hatchery should be renovated and enlarged, or if a new hatchery should be constructed; (2) keep the Miles City Hatchery operating for two more years, as it was scheduled to be permanently closed by the U.S. Fish and Wildlife Service; (3) fund a special crew to take eggs from spawning walleye in the wild for incubation and hatching at Miles City.

The hatchery continued operating,



JIM LIEBELT

and biologists tried to collect walleye eggs below Intake Dam on the Yellowstone River during spring of 1983. Only about one-half million eggs were taken, because low water and equipment problems hindered the attempt. An engineering/economic consulting firm was hired to study the hatchery situation, and their recommendations will be released later in 1984.

This past winter, members of the Glasgow chapter of WUM met for a weekend chili feed and reef construction party on the frozen shores of Fort Peck Reservoir. The group's purpose was to construct an artificial reef for fish, using several thousand discarded tires, Christmas trees, nylon rope, and rocks.

The idea for this project emerged about two years ago as a way to help improve forage fish populations in one small area of gigantic Fort Peck Reservoir. The Glasgow sportsmen organized a tire drive, with the collection site near the Fort Peck Marina. It wasn't long before a huge pile of tires had accumulated. The U.S. Corps of Engineers gave permission to the Glasgow chapter to build the reef, and a date

was set.

Members hauled the tires and a few hundred Christmas trees several miles to the construction site. Using pickups and ropes, the items were skidded across the ice onto one of Fort Peck's bays. By late one Sunday afternoon, a structure about 50 yards long, 10 yards wide, 12 feet high, and resembling a giant porcupine had been tied together. The reef now rests on the bottom of Fort Peck Reservoir in about 35 feet of water and will attract and provide cover for small fish. This, in turn, should bring in larger predatory fish such as walleye, sauger, and northern pike. The fish will benefit, and so will the fishermen.

Walleyes Unlimited of Montana has positively influenced the state's warm-water fisheries program. The Department of Fish, Wildlife and Parks has supported the organization's efforts, and WUM, in turn, has supported the department's efforts to make the warm-water fisheries program a more important part of the state's plans. Such positive influence can only result in bettering Montana's warm-water fishery.

other unknown factors.

By the 1980s, it was clear to dedicated anglers that walleye fishing in the "Big Dry" was just plain "no good." Never mind that some of the best lake trout fishing anywhere in the country existed along the face of Fort Peck Dam during spring and fall. Never mind that good catches of northern pike were taken, or that abundant populations of channel catfish and sauger remained almost untapped in other areas of the reservoir. Those facts really didn't make any difference. There was only one solution to the fisheries dilemma in Fort Peck, and that was more walleye!

The department continued with vigorous stocking and from 1980 until today, over 7.2 million walleye have been released in the reservoir. During this time, almost 1.4 million northern pike have been planted, and two new species, smallmouth bass and chinook salmon, were stocked for the first time.

Smallmouth bass have a real potential for augmenting the sport fishery in Fort Peck since they should adapt well to conditions and are considered a premier sport fish in many other parts of the United States. Success depends on their ability to reproduce and bring off strong year-classes (fish hatched in a particular year), as well as the availability of forage to produce adequate growth.

On the other hand, chinook salmon have the potential to reach large sizes, but they would have to be planted periodically to sustain a sport fishery. The chance of them reproducing naturally in any of the tributaries to Fort Peck is slim. Chinooks take from three to five years to mature, after which they die; their eventual size is also related directly to forage abundance.

With the stocking of millions of walleyes and other predator species, and the fact that walleye already in the reservoir were not growing well, the forage fish picture assumed paramount importance. The availability of forage fish for predators—particularly walleye, sauger, and north-erns—is the foundation of a good sport fishery.

—— Finding a Forage Fish ——

The department was now committed to finding and choosing a forage



MIKE ADERHOLD



MIKE ADERHOLD

Since 1980, over 7.2 million walleye have been released in Fort Peck Reservoir. To help biologists gather more information, walleye in the Big Dry Arm of the reservoir have been captured, tagged, and released.

seemed to offer at least a partial solution to Fort Peck's forage fish problem.

Spottails have a lot going for them: They are important food for walleye; they can spawn successfully over various substrates (sand, gravel, and aquatic vegetation); they are prolific; they utilize a wide variety of food, such as algae and invertebrates; they inhabit water less than 30 feet deep. An environmental impact statement (EIS) was written, and bureaucratic machinery was put in motion to plant spottails in Fort Peck.

The first attempt to transplant them met with only limited success. A few thousand were transported from Oahe Reservoir to Fort Peck in June 1982; the fish were live-trapped in Oahe, but inclement weather resulted in poor catches. The department then had the chance to buy spottails directly from a dealer in Minnesota. During May and June of 1983, almost 185,000 were planted in several areas

fish that would: (1) live, grow, and reproduce in Fort Peck; (2) be free of diseases and parasites that might possibly affect fish already there; (3) not cause problems such as predation of or undue competition with other species; (4) have the potential for becoming abundant; and (5) be used as food by predatory fish.

Several piscine candidates were examined, but one stood above the rest: the spottail shiner. The spottail's native range is the Midwest, extending into central Canada. This species had already been introduced into Garrison and Oahe reservoirs in North and South Dakota and into several Wyoming lakes as well. It was doing well in the large reservoirs and

of the reservoir. These fish were mostly adults in pre-spawning condition, and biologists hoped they would find favorable conditions for successful spawning. Seining by department fisheries workers in fall 1983 took enough young of the year to indicate this occurred. Plans include making additional plants, if necessary, to ensure establishment of this species in Fort Peck.

During this time, a great deal of pressure was also being placed on the department to plant rainbow smelt in Fort Peck. The North Dakota Game and Fish Department had planted them in Garrison Reservoir in 1971 and, in a short time, the population literally "exploded." Walleye and other predators benefited greatly from the incredibly abundant food supply, and soon stories of giant walleye and fabulous fishing brought national attention. This led to many fishermen believing that introducing smelt would be the answer to Fort Peck's problem.

Another EIS was prepared, which considered the feasibility of planting smelt as well as other species. It became apparent there were more than just a few unanswered questions about the possible negative effects to the fishery. Rainbow smelt prey on the eggs and larvae of other fish species; this brought immediate concern for the smelt's impact on lake trout, paddlefish, walleye, and other species established in Fort Peck. Smelt populations also fluctuate wildly, adding further concern to planting this species. According to findings in the EIS, smelt were "not a low risk introduction. Given the risks inherent with this species and the potentially less dangerous species available as forage fish introductions, the stocking of smelt in Fort Peck Reservoir is not the recommended alternative."

Since risks outweighed benefits, the department decided to introduce a species not found in the state, the cisco (also called the tulibee or lake herring). This fish is a member of the whitefish clan and therefore belongs to the trout-salmon family of fish. They normally inhabit the deeper, colder regions of lakes, and seemed the ideal candidate for Fort Peck. They spawn in shallow water during late fall, over a variety of substrates, with the eggs hatching the following

spring after the ice leaves. They feed on plankton (microscopic plants and animals) and insects, and reach an average maximum size of 12 inches. They are an important food item for walleye in some Canadian lakes and would probably assume this importance for walleye and other predatory fish in Fort Peck.

Approximately 9.4 million cisco fry were planted in Fort Peck this spring. The eggs were originally taken from cisco populations in Minnesota and Saskatchewan in fall 1983 and hatched at Fort Peck and the Miles

Flathead's Favorite Fish

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kokanee congregate in Skidoo Bay. Biologists do not know what draws these fish to this part of the lake. The schools rise to the surface at dawn and dusk; at these times, capture with a 30-foot-deep purse seine has been extremely effective. (A purse seine is a long net that hangs like a circular curtain in the water with the top and bottom open. Using two boats, the net is pulled out, forming a circle and, with luck, trapping a school of fish inside. The bottom is closed, the top line drawn into a smaller circle, and the fish netted from the seine and information recorded.) Captured fish are marked with a tag behind their dorsal (top) fin.

The information gathered from the marked fish will answer some important questions about this unique fishery. Tag returns throughout the summer and fall will tell biologists where these fish go and when, and if they are all from one stock or from a variety of spawning areas. The 30-foot-thick schools have provided fishermen with a rare opportunity to easily harvest their limits without using sophisticated sonar equipment or expensive boats. Biologists are concerned, however, that if all these fish in Skidoo Bay are from one spawning area, the intense harvest could significantly impact that stock of fish. (If you catch one of these tagged kokanee this summer, please report the date and location to the Department of Fish, Wildlife and Parks.)

A creel census of the Skidoo Bay fishery conducted during winter of 1984 estimated a harvest of 45,000

City Hatchery. Plans are to continue planting for several years, or until a self-sustaining cisco population is established.

Fisheries personnel believe that once substantial populations of spot-tail shiners and cisco are established, predatory species will benefit from the increased food supply. This could mean more rapid growth, longer life span, larger average and maximum sizes, greater numbers, increased reproduction, and eventually, better fishing. Only time will be the final judge. ■

kokanee. It appears that the reduction in the daily limit of 35 in 1982 to 10 today has produced the desired results. Harvest was about one-third of that in winter 1982, when an



MIKE ADERHOLD

Purse seining is a research technique in which biologists "trap" a school of fish inside a large net. Information about the captured fish is recorded, and they are then tagged.

estimated 120,000 kokanee were caught by anglers.

It has not been an easy job to understand the kokanee, and biologists certainly don't have all the answers. Economists tell us the public is willing to spend \$97 million to preserve Flathead Lake in its present condition. Forty percent of the people who visit Flathead Lake do so to enjoy the fishery, and 92% of the fish caught are kokanee. There is no denying the kokanee's importance. We think it has been worth the effort to try to answer questions about Flathead's favorite fish. ■

